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SOUTHERN LIGHTS

SOUTHERN LIGHTS

The Official Account of the
British Graham Land Expedition
1934-1937

BY

John Rymill

With two chapters by

A. STEPHENSON

and an Historical Introduction

by

HUGH ROBERT MILL

THE TRAVEL BOOK CLUB

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PREFACE

THIS book is a narrative of the British Graham Land Expedition (1934-1937) describing in a very general way our plans and our travels; the country and the climate; our pleasures and our disappointments. The results of our efforts other than exploratory, and such new problems and theories in the realms of geology, biology, meteorology and so on that we were able to give rise to, are not described. But it must be remembered that throughout the expedition scientists were doing their best to make the most of every opportunity that was offered. Often the general needs of the expedition, such as unloading cargo, building the houses, cooking meals, and a small share in the maintenance work made ordinary scientific work impossible, but this was quite unavoidable with as small a personnel as ours. Yet even when on watch at sea they were sometimes able to combine science with seamanship, by watching the distribution and habits of ocean birds, or trying to interpret the rock and ice formations on islands as *Penola* threaded her way among them. Naturally, however, they were always delighted when, their general duties done, they were free to carry on their scientific research unhindered.

To sum up the results of a complex expedition working over a long period is difficult; especially as the scientists of the party will not be prepared to make any definite statements about the research in their particular branches of science for many months, when they will have finished working up their results. But as far as our exploratory work is concerned, we were able to work in a previously unvisited part of the Antarctic and make two major discoveries. First, that Graham Land is part of the Antarctic Continent and not an archipelago, as was previously thought, and secondly, that a great channel running approximately north and south separates Graham Land from Alexander Land. Since our return to England, His Majesty the King has graciously given permission for this channel to be called King George VI Sound.

Although no details of the scientific work can be included here, some idea of what was done may be of interest. Stephenson, the Chief Surveyor and Meteorologist, before each sledge journey would prepare

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blank sheets on which the new country could be roughly plotted day by day as it was seen. Then, on returning to the Base, he would work long hours until the accurate new map was completed, based on astronomical observations taken along the line of travel, and hundreds of theodolite and compass bearings and his multitude of quick panorama sketches. Likewise after each aeroplane flight he would produce a tentative map of the country that had been seen. In the intervals between the longer sledge journeys he spent much of his time making accurate large-scale plane-table surveys of the neighbouring coasts and small islands. As well as being Chief Surveyor, Stephenson, together with Riley, looked after the meteorological work. Both at the Northern and Southern Bases full meteorological observations were taken (see the tables at the end of the book), and besides the usual self-recording instruments direct observations were made five times a day. In bad weather, keeping the instruments clear of drift and in working order was in itself almost a whole-time job.

Fleming was the geologist, and wherever he went he examined the rocks if they were in any way accessible, and collected specimens. Our greatest purely geological find was the discovery that the southern part of Alexander Land was different from the whole of Graham Land, being made of sedimentary rather than of volcanic rock. Besides taking measurements of local snow and ice conditions, Fleming spent much time studying and interpreting the glacial topography of the country; the narrow fringing glaciers of the coast and the remnants of a once more widespread shelf-ice being of special interest to him.

Bertram and Roberts, the former a general zoologist and botanist, the latter a specialized ornithologist, studied the animal and plant life. The investigation of the very many seals killed for man and dog food was Bertram's chief work. This involved the preservation of a large number of skulls and strange portions of the seals. But besides this he examined the lichen and mosses and collected the animals living in the shallow waters near the islands. Much of Roberts' work on the various birds of Graham Land, the Falkland Islands and South Georgia, was of a very detailed kind. The behaviour of individual birds, sometimes identified with splashes of coloured paint, being followed from day to day. Besides this study of the birds, Roberts set up a tide gauge which was used during the winter period at the two Bases.

The pursuit of these various studies, here very briefly indicated, and

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the writing up of notes about them, kept the expedition's scientists always busy, particularly as any one of them who was not actively engaged on his own work, was usually doing odd jobs to help another.

In this account I have avoided technical terms as much as possible, but it has been necessary to use a few which may need explaining. These are: Shelf-ice, which is permanent ice connected to the land and mainly formed *in situ*. It either floats on the sea or rests on coastal shallows. Brash-ice is a general term for small fragments from a floe or berg that is breaking up. Calving is a term used for the birth of an iceberg, or a fall of smaller pieces of ice from a glacier or shelf-ice face. A tide-crack is the zone of broken ice along shore-lines caused by the movements of the ice under the influence of the tide.

All times are given as Local Mean Time which is taken as 4 hours west of Greenwich, the temperatures are given in Fahrenheit, and the miles are statute miles.

The expedition business has not been fully wound up at the time of going to press, so no balance sheet can be published here, but it is interesting to record that the expedition, which was maintained for three years, will have cost a little less than £20,000.

To thank everybody who has helped the expedition would take many pages, but I would like to include here my sincerest gratitude to our many supporters, the Colonial Office, the Royal Geographical Society, the Corporation of the City of London, Lloyd's, Lord Wakefield, Major Moore, Mrs. Henry Cadbury, Doctor Robert Fleming, Sir Arthur and Lady Bagshawe, Mr. K. P. Birley, Mrs. Patrick Ness, Lord Luke, Lord Leverhulme, Lord Cadman, Mr. Louis Clarke, Lord Weir and the Hon. J. K. Weir, Mr. William Meek and Messrs. Salvesen, all of whom combined to make the expedition financially possible. I am also indebted to the Admiralty and War Office for their generous loan of personnel and equipment, and to Admiral Sir William Goodenough, Admiral Sir Percy Douglas, Professor Frank Debenham, Mr. James Wordie, the late Major-General Sir Percy Cox, Mr. Hinks, and August Courtauld for their valuable assistance and advice, and especially to J. M. Scott, who acted as our home agent.

HISTORICAL INTRODUCTION

By Hugh Robert Mill

THE British Graham Land Expedition of 1934-37 encountered and overcame many difficulties and achieved remarkable success. The nature of the problem before it and the advance made towards a complete solution can only be appreciated by looking back to the efforts of the pioneers who groped through the mists enshrouding the portion of the Antarctic lying nearest to the inhabited continents. It adds to the human interest of this history when the varying motives which drew adventurers to those forbidding regions are kept in mind.

In the early decades of the sixteenth century the development of sea trade to the Far East was the main object of the maritime powers of Europe. The Southern Ocean was discovered in the search for an entrance to the Pacific by which to reach the Spice Islands without encroaching on the Portuguese route round the Cape of Good Hope and across the Indian Ocean. The Spaniards, picking their way along the uncharted coast of South America, proved that the wide entrance of the River Plate was a blind alley, but in 1520 Magellan, pushing further south, found and threaded the maze of channels from Cape Virgins on the Atlantic to Cape Pillar on the Pacific. From that time the Straits of Magellan became the new though more hazardous road to the Indies. Sir Francis Drake, in order to raid the Spanish treasure ships, worked his way through the straits in 1578, believing like everyone else that the tortuous and tempestuous channels separated South America from a vast Southern Continent—the Third World, which with the Old World of Europe, Asia and Africa and the New World of the Americas completed the habitable globe. Drake encountered strong northerly winds in the Pacific which drove him far to the south and east, and he convinced himself that there the Atlantic and the

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Pacific "meet in a most large and free scope," south of Tierra del Fuego. With good cause, therefore, the name of Drake appears on modern maps to designate the broad fairway by which the Southern Ocean blends the Atlantic with the Pacific, though strict rules of terminology may be strained to call it Drake Strait. It was not, however, until 1615, when two Dutch ships under Schouten and Le Maire sailed round the south of Tierra del Fuego, discovering and naming Cape Horn, that navigators began to use this passage in preference to Magellan Straits.

Throughout the sixteenth and seventeenth centuries the geography of the Southern hemisphere was indistinct and confused. Anything could be believed of regions so rarely approached and of positions so vaguely indicated by rude and inaccurate instruments, places, too, where mid-summer occurred in December and mid-winter in June, where such familiar constellations as our southern Orion appeared head-downwards near the northern horizon, where the sun and moon and all the stars pursued their daily round of the heavens counter-clockwise.

In the seventeenth century the English buccaneers made much use of the Cape Horn passage in their famous voyages to the coasts of the Pacific, and from their racy narratives many strange facts became common knowledge and Antarctic icebergs swam into the ken of literary men and were immortalized in such romantic tales as Coleridge's "Ancient Mariner."

Even after Australia had been discovered, the idea of a great Southern Continent stretching from the Pole far into the temperate zone of the Indian Ocean, and even to the tropics in the Pacific, found supporters. The second voyage of Captain James Cook (1772-75) was planned by the Royal Society mainly to settle the question, and Cook satisfied himself and the learned world that if any Southern Continent existed it must be almost entirely within the Antarctic Circle, and that any attempt to investigate it more closely than he had done could be of no benefit to mankind. Cook saw no Antarctic land; but his re-discovery of South Georgia and his discovery of the South Sandwich

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Islands led to the creation of a very active sealing industry which continued to employ a fleet of small vessels from British and New England ports until the valuable fur seal was practically exterminated.

The sealers were most active in the first three decades of the nineteenth century; but although they pushed some distance to the south and vaguely reported many landfalls, as far as geography was concerned, the main result was controversy.

The northern limits of the sealing trade between the meridians of 20° and 80° W. included Tierra del Fuego, the Falkland Islands and South Georgia, and these limits, if we except South America and the Falklands themselves, include all that is now defined as the Falkland Islands Dependencies, a region which corresponds in latitude and area to the Scandinavian countries from Denmark, through Norway, Sweden and Finland to the Pole. To this region I confine the sketch of the progress of exploration since the beginning of the nineteenth century. Much of what follows has already appeared in the *Polar Record*, for which it was compiled before Mr. Rymill set out on his expedition. It has been slightly extended and carefully revised to ensure accuracy.

Up to 1819 nothing was known of the region south of Cape Horn except that the ocean was exceedingly tempestuous and often encumbered by great ice-islands drifting from the south, but in that year two important events happened. The greater was the dispatch from Russia of two naval vessels under the command of Captain Bellingshausen with orders to supplement Captain Cook's second voyage by circumnavigating the world for discovery in high Southern latitudes.

The second and minor event was that Captain William Smith, a trader between Buenos Aires and Valparaiso, made a wide southerly sweep in rounding Cape Horn westwards in his brig *Williams* and discovered land, which, as it lay in latitude 60° , he called South Shetland. He verified his discovery on a second voyage and reported to the senior British naval officer on the South American station. That officer saw the importance of discovering a possible harbour under the British flag (for the Falklands were still foreign), and he chartered the *Williams* with

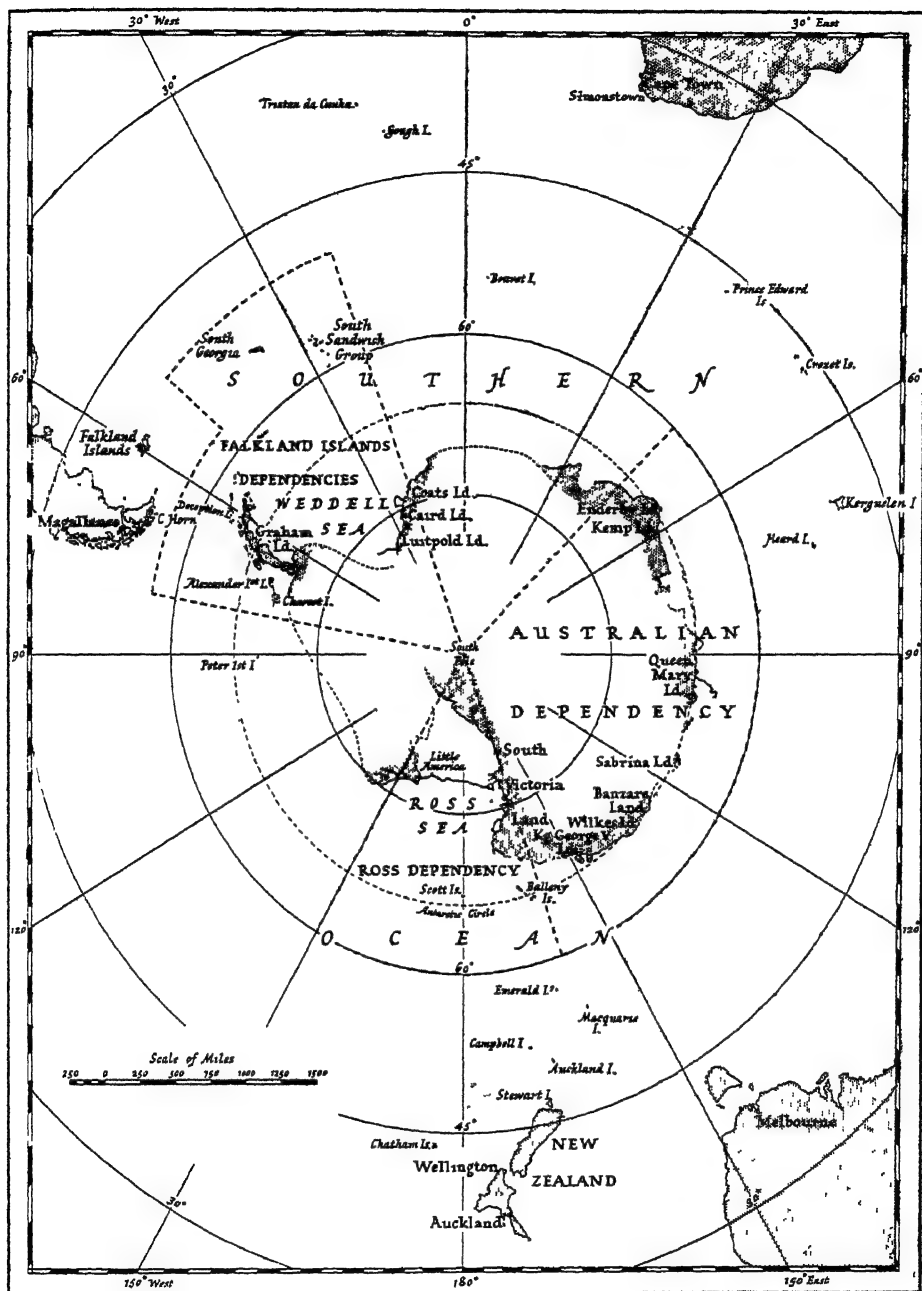
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Smith as pilot and dispatched her under Edward Bransfield, a naval officer, to survey the new discovery. Bransfield charted the string of South Shetland islands running from south-west to north-east and found that they were separated by a strait, to which his name has been given, from a parallel coastline further south which he named Trinity Land, not from the pious custom which actuated the old Spanish explorers but in honour of the nautical services of Trinity House on the Thames.

American sealers flocked to the islands, making their headquarters in the crater harbour of Deception Island. The name of Palmer Land or Palmer Archipelago commemorates one of the most intelligent of these early explorers. For these discoveries and for others north of the Antarctic Circle the reader is referred to *The Siege of the South Pole*, where references to original sources of information will be found. The discoveries of this region south of the Antarctic Circle, however, must be referred to here in more detail.

The Russian expedition under Bellingshausen was at sea from 1819 to 1821, carrying out general instructions to supplement Captain Cook's exploration in the Southern Ocean by endeavouring to reach a high latitude where Cook's course had been more to the north. The only full description of the cruise was published in Russian in 1831. A German translation, much condensed, was prepared by H. Gravelius for the Dresden Geographical Society (Leipzig, 1902, pp. 203); but the full English translation produced under the supervision of Professor F. Debenham has not yet found a publisher.

On January 21st, 1821, Bellingshausen reached his furthest south, 69° 53' S. in 92° W., and, following the edge of the pack to the eastward, discovered on January 22nd Peter I Island, the first land ever seen in the Antarctic regions proper, in 68° 57' S., 90° 46' W.; and on January 29th, when in 68° 43' S., 73° 10' W., he sighted Alexander I Island about 40 miles to the southward on a perfectly clear day, allowing its mountainous nature to be plainly recognized. On February 2nd Bellingshausen was compelled to cross the Antarctic Circle northward in 76° W.,



The Antarctic Continent as it was known at the outset
of the Expedition

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and he saw no more land until two days later he reached the South Shetlands and met American sealers.

The nature of the land discovered on these expeditions was similar in the north and the south of what has since been named the Bellingshausen Sea. Lofty mountains or high rocks rise steeply from the sea or from sheets of level ice and are nearly covered by ice or snow, black rocks alternating along the coasts with gleaming white ice-cliffs, making landing impossible except on the infrequent narrow beaches from which the interior is inaccessible or nearly so.

Pursuing the search for new sealing grounds, in 1821 a British sealer, George Powell in the *Dove*, and the American sealer, Nathaniel B. Palmer in the *James Monroe*, who came at Powell's request, discovered the South Orkney Islands in 60° S. and about 45° W.; while James Weddell, who was an ex-naval officer and a good navigator, sighted the South Orkneys in February 1822, unaware of Powell's earlier visit. In 1823 Weddell made a great voyage southward through an ice-free sea, reaching $74^{\circ} 15'$ S. in longitude 34° W. Here, unfortunately, a shortage of supplies made it necessary for him to turn: such complete freedom from ice has never been reported again in that region. The discoverer named it the George IV Sea; but by common consent it has long been known as the Weddell Sea. The discovery is described by Weddell himself in *A Voyage towards the South Pole*, 1825. In 1823, also, an American sealer, Morrell, a man of many words, claimed to have seen and landed upon a coast which he called New South Greenland south of the 62nd parallel and near the meridian of 50° W., but no land has ever been seen again near that position.

The central point of the South Shetland group is the ring-shaped Deception Island in approximately 62° S. and 60° W. It appears from all sides but one to be of the usual steep and inaccessible character, but is really only a ring of high land, the rim of a vast volcanic crater. A single narrow channel leads to a great harbour occupying the whole interior, spacious enough to contain a navy and deep enough for the largest vessel afloat. From January to March 1829 it was the head-

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quarters of Captain Henry Foster in H.M.S. *Chanticleer*, engaged in observations of the force of gravity in high latitudes. He did not go further south, however, than $63^{\circ} 43'$ S. in $61^{\circ} 45'$ W.

In the city of London a long-established firm of shipowners, the Enderby Brothers, were concerned in the Antarctic sealing trade, and one of them, Charles Enderby, was much interested in geographical discovery, and became an original member of the Royal Geographical Society. He encouraged his captains, who were men of experience and intelligence, to combine discovery with trade, and one of these, John Biscoe, made a very remarkable circumnavigation of the Antarctic regions in 1830-32. Biscoe discovered Enderby Land south of the Indian Ocean; then, like Bellingshausen, of whose discoveries he had not heard, Biscoe came eastward in a high latitude and sighted land in 67° S. and 70° W. The record of this discovery is given in his log, which was presented to the Royal Geographical Society by Mr. Enderby and earned for John Biscoe the award of the Royal premium of £50, which at that time took the place of the Founder's and Patron's Medals. The substance of the log was published in the *Antarctic Manual* compiled for the Society in 1901.

The island which Biscoe sighted on February 15th, 1832, and believed to be the most southerly land yet discovered, he named after Queen Adelaide. The body of the island lay 3 miles to the east of the ship, which was stopped, presumably by ice, in water more than 250 fathoms deep. The only description of the island is that it contained very lofty mountains "about 4 miles in extent" rising from a field of snow and ice "about 4 miles in extent" sloping gradually to the sea, and terminating in ice-cliffs 10 or 12 feet high. Biscoe thought that it was a group of huge perpendicular cliffs closely beset by sea-ice, but his mind was strongly prejudiced in favour of all Antarctic ice being marine in origin, and he was apparently unfamiliar with the nature of glaciers. On February 16th, while on a course north-east from Adelaide Island, Biscoe saw high mountains to the southward in very clear weather and estimated them to be about 90 miles distant. These might well be on

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Alexander I Island. For three days, February 16th-18th, Biscoe ran to the east-north-east along the north-western side of a chain of islands (the Biscoe Islands). He described them as of "exactly the same appearance as Adelaide Island," but added that "they had no mountains on their tops." To one of these, Pitt Island, in $65^{\circ} 20' \text{ S.}$, $66^{\circ} 38' \text{ W.}$, which seemed to join the mainland, he sent a boat which brought back a report that it contained "an excellent harbour for shelter, although a rocky bottom." Beyond these islands to the eastward a mountainous mainland appeared very imposing in clear weather. On February 21st Biscoe pulled in to this mainland, landed and took possession of it in the name of King William IV, and named the highest mountain Mt. William; its latitude was fixed as $64^{\circ} 45' \text{ S.}$ The landing was made on what we now know as Antwerp Island, though Biscoe, like Palmer before him, took it to be part of the mainland to which he gave the name of Graham Land after the First Lord of the Admiralty. However, Biscoe saw no fur seals on these coasts and moved further north in search of them.

A second voyage to the Bellingshausen Sea was made by Biscoe in 1833 with a naval officer named Rea lent by the Admiralty, but it met with no success and no precise records of it are preserved.

In 1833 the British Government annexed the Falkland Islands, and the best harbour, Port Stanley, soon became important as a centre for sealers and a place where ships could refit when damaged in the passage round Cape Horn. It remains the seat of the Government and the one town of the colony.

Three great Government expeditions for scientific research and discovery by naval ships of three nations were in the field almost simultaneously between 1837 and 1843, and they all visited the portion of the Antarctic south of South America. Two vessels of the American expedition under the command of Lieutenant Charles Wilkes reached 70° S. in the west of Bellingshausen Sea in 105° W. , but heavy ice prevented them from making any discoveries of land.

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A French expedition under Captain Dumont d'Urville in February 1838 discovered Joinville Island in 61° S. and 55° W., and south of it Louis Philippe Land. These lands were found to be on the east coast of Trinity Land and form the north-eastern extremity of Graham Land. Captain James Clark Ross in the British ships *Erebus* and *Terror* endeavoured to explore the same coast in December 1842 but could not get further south than 65° S. on account of the heavy ice-floes, from which he had some difficulty in freeing his ships. The ships left their name in Erebus and Terror Gulf. Dumont d'Urville had spent the months of January and February 1838 in trying to get south near Weddell's meridian, but was baffled by heavy floes and was inclined to doubt the truth of Weddell's achievement. Ross, however, by coasting the pack to the eastward, was able to get round it and reached $71^{\circ} 30'$ S., $14^{\circ} 51'$ W., on March 5th, 1843. (See J. C. Ross, *Voyage to the Antarctic Regions*, vol. ii., London, 1845.)

Up to this time only sailing vessels had been employed in Antarctic waters, and not until 1874 did steam power come into the field. In that year Captain E. Dallmann in the German whaler *Grönland* sighted the west coast of Graham Land in $64^{\circ} 45'$ S. but did not proceed further. He reported a wide opening in the coast which he named Bismarck Strait, and suggested that it might lead through to the Weddell Sea. Nearly twenty years were to elapse before another propeller stirred Antarctic waters.

The failure of the Arctic whale fishery in 1892 induced four Dundee ships and two Hamburg vessels, the latter under Norwegian skippers, to test Ross's statement that great numbers of whales frequented Antarctic waters. Dr. W. S. Bruce made his first acquaintance with the Antarctic on board the *Balaena*, one of the Dundee ships, and Captain Thomas Robertson commanded the *Active*, another of the fleet. They visited Erebus and Terror Gulf in the extreme north-west of the Weddell Sea and discovered Dundee Island, but did not get further south than 64° S.

In the following season the Norwegian ships returned to the area and

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got well to the south of the Antarctic Circle, both on the west and on the east of Graham Land. Captain C. A. Larsen in the *Jason* entered the Weddell Sea and reached what appeared to be the east coast of Graham Land in 66° S. and 60° W., on December 1st, 1893; he named it after King Oscar II. Two days later he crossed the Circle, and proceeded southward along a stretch of flat shelf-ice extending from a mountainous coast which appeared to run continuously from north to south. To the loftiest part of this the name of Svend Foyn Land was given. Larsen was stopped by pack-ice in 68° 10' S. on December 6th, and no one else has been able to follow this coast by sea or on land to so high a latitude. Larsen's voyage is dealt with most fully in Aagaard's *Fangst og Forskning i Sydishavet* (Oslo, 1930).

It is convenient at this point to diverge from a strictly chronological order so as to complete in a continuous narrative the account of exploration in the Weddell Sea.

With the revival of Antarctic exploration at the beginning of the twentieth century two expeditions sought the Weddell Sea simultaneously with the voyages of the German ship *Gauss* and the British *Discovery* to East Antarctica.

The first of these purely scientific undertakings sailed from Sweden in 1901 and was organized and led by Professor Otto Nordenskjöld on board the *Antarctic*, commanded by C. A. Larsen, who once more tried to reach the coast of Oscar II Land in January and February 1902. The ice conditions were so bad that he could not get near land nor penetrate further than 66° S., which was reached on January 19th, 1902. On February 12th winter quarters were established on Snow Hill Island in 64° 25' S. In the following year the ship could not reach even this position and was lost after being crushed in the pack. Nordenskjöld's party had thus to spend a second winter in their hut. They were rescued by the Argentine ship *Uruguay*, which reached Snow Hill Island on November 8th, 1903. Nordenskjöld made a sledge journey southward on the shelf-ice in front of Oscar II Land, reaching 65° 50' S. on October 19th, 1902. Later he explored the scene of Ross's landing,

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and showed that Mt. Haddington was situated on a large island separated from the east coast of Trinity Peninsula, and now called Ross Island. For details see O. Nordenskjöld, *Antarctic* (Stockholm, 1904), translated as *Antarctica* (London, 1905).

The second expedition was organized in Scotland by Dr. W. S. Bruce and sailed in 1902 under his leadership on board the *Scotia*, whose captain, Thomas Robertson, had formerly commanded the *Active*. An attempt was made to penetrate the Weddell Sea between the tracks of Weddell and Ross; but the ship was stopped by very heavy pack in $70^{\circ} 25' \text{ S.}$ on February 22nd, 1903. After wintering in the South Orkneys Bruce returned the following season. This time the pack gave less trouble and, on March 6th, 1904, he discovered Coats Land, entirely buried in ice but rising to a great height. He was able to approach to within 2 miles of the ice-cliffs and at his furthest point was in $74^{\circ} 1' \text{ S.}, 22^{\circ} \text{ W.}$ Details of the work of the *Scotia* are given by three of the staff in *The Voyage of the Scotia* (London, 1906), and by one of them, R. N. Rudmose-Brown, in *A Naturalist at the Poles* (London, 1923).

In 1911 Lieutenant W. Filchner planned to cross the Antarctic Continent from the south of the Weddell Sea. He entered that sea in the *Deutschland* from the north-east and sighted a new coast south of Coats Land which he named Luitpold Land. It was high and snow-covered; a party landed and went inland for a short distance, reaching a height of 975 feet above the sea. The furthest point, named Vahsel Bay, was reached on January 30th, 1912, and its position fixed as $77^{\circ} 45' \text{ S.}, 36^{\circ} \text{ W.}$ An attempt was made to establish a winter base on the ice fast to the land; but this failed. The ship was beset in the pack on March 6th, 1912, and drifted helplessly for more than eight months, first in a north-westerly direction, then northerly, then (about 65° S.) easterly and finally northerly, until the dense pack broke up and the *Deutschland* became free again in $63^{\circ} 37' \text{ S.}, 36^{\circ} 34' \text{ W.}$ on November 6th, 1912. In June, when in $70^{\circ} 27' \text{ S.}, 44^{\circ} \text{ W.}$, a sledge trip was made westward over the pack to the position of the legendary

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New South Greenland, but no sign of land was seen. Filchner has described his voyage in *Zum sechsten Erdteil* (Berlin, 1922).

An expedition on a large scale was planned very carefully by Sir Ernest Shackleton, who proposed to land, as Filchner had done, in the south of the Weddell Sea and sledge thence to the South Pole, returning by the Beardmore Glacier and Ross Sea. Sailing in the *Endurance* in 1914, he met a worse fate than Filchner. On January 9th, 1915, having entered the north-east part of the Weddell Sea, he cleared the pack in $69^{\circ} 47' \text{ S.}$, and had a quick run to $72^{\circ} 34' \text{ S.}$ when Coats Land was sighted in $16^{\circ} 40' \text{ W.}$ and followed south-westward to beyond the *Scotia's* furthest, where the continuing land was named the Caird Coast. It apparently ran on to join Luitpold Land on the south-west. The furthest point was reached on January 19th, 1915, when the *Endurance* was beset in $76^{\circ} 34' \text{ S.}$, $31^{\circ} 30' \text{ W.}$ She was drifted with the ice first towards the south-west, then on a course at first nearly parallel to that of the *Deutschland*, but more than 100 miles further west. Later the drift became northerly between 47° and 53° W. The ship was crushed in August 1915, and sank, but the party continued on the pack, drifting northward until the ice broke up, and the boats were launched on April 9th, 1916, in 62° S. , the drift having lasted for nearly fifteen months. Full details of the expedition of the *Endurance* are given in Shackleton's *South* (London, 1919), in Mill's *Life of Sir Ernest Shackleton* (London, 1923), and in Worsley's *Endurance* (London, 1931).

Recent discoveries in the Bellingshausen Sea, though they have not penetrated so far to the south as those in the Weddell Sea, have been more extensive and detailed.

While the *Jason* was attaining the high latitude in 1893 on the east side of Graham Land, her companion vessel the *Hertha* found the Bellingshausen Sea freely navigable at a very early date. On that occasion Captain C. J. Evensen, after passing the parallel of 64° S. on November 7th, reached $69^{\circ} 10' \text{ S.}$, $76^{\circ} 12' \text{ W.}$ on November 20th, meeting very little ice despite the season. On November 22nd he came nearer Alexander I Island than any previous navigator, and found it closely

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surrounded by pack-ice. On November 30th the *Hertha* was back in the South Shetlands and proceeded to the Weddell Sea. During her stay on the west side of Graham Land she passed between some of the Biscoe Islands and the mainland for the first time, and cruised in sight of the islands for some days. I am not acquainted with any detailed account of the cruise of the *Hertha*, and Dr. Charcot could not get any precise data in a personal conversation with Evensen, who could only say, "Very high and fine mountains. Plenty of icebergs" (*Le Pourquoi Pas? dans l'Antarctique*, p. 108).

The International Geographical Congress held in London in 1895 passed a resolution declaring that the exploration of the Antarctic regions was the most important piece of geographical work remaining to be done. The immediate result of this challenge was the equipment of a Belgian expedition, promoted and commanded by Captain A. de Gerlache with Roald Amundsen as mate. Sailing in the *Belgica*, he reached the South Shetland Islands on January 20th, 1898, in bad weather. He discovered and explored De Gerlache Strait leading from Hughes Gulf to Bismarck Strait between 64° and 65° S. and 61° and 64° W., proving that what had been taken as the west coast of Graham Land is really a group of large islands which he named Liège, Brabant and Antwerp, Biscoe's Mt. William being recognized on the last-named. The coast east of these islands was named Danco Land, while Bismarck Strait ran eastward into a cul-de-sac called Flanders Bay. On February 12th the *Belgica* left De Gerlache Strait and proceeded southward along the coast of Graham Land as near as the ice and numerous icebergs permitted. She passed to the west of the Biscoe Islands, of which little was seen on account of fog.

Gerlache crossed the Antarctic Circle southward on February 15th, nearly in 69° W. Turning southward, an attempt was made to reach Alexander I Island, but the ship was stopped by pack-ice when 20 miles north of the land, which was clearly seen. Arctowski saw high land to the east which seemed to him to be the southern end of Graham Land, or at least the edge of a wide strait. The position would not show the

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southern end of Fallières Coast on an easterly bearing, and possibly the southern end of Adelaide Island was seen. Arctowski lays stress on the fact that Alexander I Island rises from a broad ice-foot of confluent glaciers, and disputes F. A. Cook's description of the island (see *Antarctic Manual*, p. 496). The edge of the pack was reached in $70^{\circ} 20'$ S., 85° W. on February 28th. Entering a gap torn in the pack by a furious gale, the *Belgica* worked her way to $71^{\circ} 31'$ S. on March 3rd. Here she was beset, and drifted about with the ice for thirteen months. The drift covered an area in latitude between $71^{\circ} 30'$ S., where the depth was 210 fathoms, and 70° S., where the depth was 1000 fathoms, and in longitude between $80^{\circ} 30'$ W. and 102° W., at which point she recovered freedom of motion on March 14th, 1899, and thence a straight course was made for Punta Arenas, the port now rechristened Magallanes.

Gerlache gives a popular account of the voyage in *Quinze mois dans l'Antarctique* (Brussels, 1902); but there are clearer maps in Lecointe's *Au Pays des Manchots* (Brussels, 1904), while F. A. Cook's *Through the First Antarctic Night* (London, 1900) is important for its medical details of the bad effects of wintering in the ice when ignorant of the proper precautions.

In 1903, when the achievements of the expeditions under Scott, Drygalski, Nordenskjöld and Bruce were exciting the geographical world, Dr. Jean Charcot, a medical man of independent means and scientific tastes who was also a keen yachtsman, succeeded with the aid of grants from various scientific societies and the French Government in equipping an expedition to take the flag of his country back to the scenes of Dumont d'Urville's efforts in the Weddell Sea.

He sailed in the *Français*, but on hearing of the difficulties encountered by Nordenskjöld on the east side of Graham Land he turned his attention to the more promising Bellingshausen Sea in order to supplement the work of the *Belgica*.

On February 3rd, 1904, Charcot left the South Shetlands and spent a whole month amongst the islands forming the west side of De Gerlache

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Strait, much harassed by ice, fogs and bad weather. He got as far south 'as the northern end of the Biscoe Islands and named one Pitt Island, though it was obviously not the Pitt Island of Biscoe, but nearly in the same latitude. Early in March he went into winter quarters at Wandel Island, about 65° S. The *Français* put to sea again on December 25th, 1904, when the ice in which she was frozen broke up, and she proceeded in bad weather with much loose ice to the southwest, sighting the Biscoe Islands. On January 10th, 1905, he crossed the Antarctic Circle and sighted Alexander I Island at a distance. On January 15th, Loubet Coast, supposed to be attached to Graham Land, was approached within a few miles, the approximate position given being 67° S., 71° W. Damage to the ship then made a return northward necessary, and she lay for more than a month at Port Lockroy in Wiencke Island so that repairs could be carried out before resuming the homeward voyage.

Charcot immediately set about the equipment of a more ambitious expedition. He had a fine ship built and fitted for research in various departments of science, and named her, in his characteristic humorous vein, *Pourquoi Pas?*, the full force of which is more clearly given in the Scots phrase, 'What for no?' than in the correct English 'Why Not?' On his expedition in this ship he reached Port Lockroy on Wiencke Island on December 27th, 1908, and during January 1909 he explored to the southward, finding conditions more favourable than was the case in the *Français*. He identified Biscoe's Adelaide Island, but found that it was 70 miles long in place of Biscoe's estimate of 8 miles, and its ice-cliffs were 100 feet high instead of Biscoe's guess of 10 feet. It became clear to Charcot that the land where the *Français* was nearly wrecked in 1905, which had been named after President Loubet, was really the west coast of Adelaide Island, the longitude found in 1905 being in error. In his new map Charcot moved the name Loubet Coast to the part of Graham Land east of Adelaide Island and separated from it by a strait containing a group of smaller islands. Charcot followed this strait for 40 miles from its southern end, and later had a good view

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of it from the north. From the south end of Adelaide Island he found the great Marguerite Bay sweeping to the east and south, and he named its eastern shore Fallières Coast after the French President of the time. Further, he discovered a small mountainous island, named Jenny Island, close to the south-east end of Adelaide Island, and he thought that it might afford winter quarters for a ship, though there might be a risk of the island being blocked by ice for several years in succession. Charcot thought it possible that Biscoe mistook the size of the island, which he named after Queen Adelaide, on account of being at a greater distance from it than he supposed, but we have some difficulty in accepting this and prefer the explanation which Rymill gives in his narrative. Marguerite Bay was much encumbered by ice, but good views of the coast were obtained, and on January 22nd, 1909, the *Pourquoi Pas?* succeeded in coming within 2 miles of Alexander I Island.

Charcot wintered at Petermann Island (c. 65° S.) from February 3rd to November 26th, 1909, and on being released the *Pourquoi Pas?* proceeded north to Deception Island. The ship left Deception Island on January 6th, 1910, steering south-west and, after Alexander I Island had been seen again, the peaks of a new discovery, Charcot Island, were descried on January 11th. The land lay in 70° S., 75° W., about as far to the south-west of Alexander I Island as that was to the south-west of Adelaide Island, and all three were charted as of approximately equal size. Charcot continued to coast the pack to the westward, passing close to Peter I Island, seeing it for the first time since Bellingshausen discovered it in 1821. He then proceeded further westward nearly along the 70th parallel to 124° W., whence, on January 22nd, 1910, he turned back toward Punta Arenas.

The popular account of this voyage is contained in Charcot's *Le Pourquoi Pas? dans l'Antarctique* (Paris, 1910), translated as *The Voyage of the Why Not? in the Antarctic* and provided with an index (London, not dated). An account of the voyage appears in the *Geographical Journal* for 1911, vol. xxxvii. p. 241, with maps which are excellent though on rather a small scale.

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From 1910 onwards the seas south of the South Shetlands have been frequented by many whalers, mostly of Norwegian nationality or manned by Norwegian crews. They work in small powerful vessels of about 120 tons, based either on a shore station, such as South Georgia, or on a factory ship which either remains in some secure harbour like Deception Island or Port Lockroy, or else is kept at sea at a safe distance from dangers of uncharted coasts. The whalers, like the sealers of a hundred years earlier, are habitually reticent as to any discoveries they may make, and, unfortunately, it is impossible to give a systematic statement as to how far they have penetrated in various seasons to high latitudes. Mr. Gordon Hayes quotes in his *Conquest of the South Pole*, p. 250, an interesting report of two gunners named Beckmann and Mathisen in charge of whale-catchers belonging to the Leith firm of Salvesen. These men in February 1924 found the channel between the Biscoe Islands and Graham Land quite free from ice and steamed to the south of Adelaide Island. Both reported that Fallières Coast turned sharply to the east at its southern extremity, suggesting that a channel might extend through to the Weddell Sea.

On January 17th, 1927, the whale-catcher *Odd I* reached Peter I Island, having made a direct passage from the south end of De Gerlache Strait, and she circumnavigated the island for the first time, in a clear sea.

The main body of Graham Land traversed by the meridian of 65° W. runs northward from somewhere in the neighbourhood of 70° S. to the Antarctic Circle, where it bends sharply to the north-east and terminates at 55° W. in 63° S. It separates the Bellingshausen Sea on the west from the Weddell Sea on the east.

No crossing from the Bellingshausen to the Weddell Sea was ever made by land before the British Graham Land Expedition, nor by sea at any time save round Joinville Island, so that the discoveries on the western side were only connected with those on the eastern by the astronomical observations of different explorers. These were not always highly skilled in the use of delicate instruments, and the conditions of

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visibility and refraction often tinged the best technical work with error. Chronometers, after years of rough voyages, were subject to errors of rating which make many of the assigned longitudes more uncertain than in ordinary navigation.

Great hopes were raised at the beginning of aeroplane flights in the Antarctic that fresh light would be thrown on such problems as this. When the Australian, Sir Hubert Wilkins, found a practicable landing-ground for aircraft on the shores of the great land-locked harbour of Deception Island, he did in fact do much to confirm and bind together the work done by explorers in ships on both sides of Graham Land. On December 20th, 1928, Wilkins left Deception Island in an aeroplane at 8.20 a.m., and flew southward nearly on the meridian of 61° W., crossing Graham Land from Hughes Bay on the north-west to the east coast in 64° S. Doing this the plane had to rise to 8200 feet to clear the land. The centre of northern Graham Land was described as a narrow flat plateau nearly 8000 feet above sea-level and sloping down very steeply on each side. Wilkins flew on to the south above the eastern edge of the Nordenskjöld shelf-ice, parallel with the mountainous coast of Oscar II Land, recognizing some of the mountains, capes and islands charted by Larsen and Nordenskjöld. On the Antarctic Circle he saw a depression running from west to east, which he called Crane Channel, but the photographs he took suggested that this was not a strait of the sea but two valleys filled with glaciers. The interior further south was no longer a high plateau but a stretch of mountainous country, and at 12.30 p.m. it was seen to terminate in Casey Channel, apparently bounding Fallières Coast on the south. The south side of this channel was formed by a large island which he called Scripps Island, and south of that there appeared to be a very broad channel, Stefansson Strait, broken by half a dozen islands called the Finley Islands. In the furthest south there seemed to be a slope of snow rising gently from an ice-cliff coast with some nunataks showing in the north-east. Wilkins called this stretch Hearst Land, and believed it to be part of the Antarctic Continent. At 1 p.m. he states that he was over the land at a height of about

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2000 feet and estimated the position as $71^{\circ} 20' \text{ S.}$, $64^{\circ} 15' \text{ W.}$ Here he turned and flew back direct to Deception Island, where he arrived at 6.20 p.m. The weather was clear and excellent photographs were obtained. A second flight covering the northern part of the same region was made on January 10th, 1929. Full details are given in the *Geographical Review* for July 1929. Unfortunately it was impossible to see from the air either Alexander I Island or any of Charcot's definite discoveries.

In the following season, with the aid of the Discovery Committee's vessel, *William Scoresby*, Wilkins pursued his explorations by air. On December 28th, 1929, an attempt was made to reach Charcot Island by a flight from a point about 150 miles distant; but thick weather allowed of no observations of value. On December 29th, however, clear skies enabled Wilkins to fly southward from the edge of the pack in 68° S. , 75° W. , with Alexander I Island in sight, right to Charcot Island, which he flew round close to the coast. He estimated it to be 60 miles in diameter and about 40 miles north of the coast of Hearst Land, which presented the same appearance as the portion first seen south of Graham Land. Two other islands were seen at a distance to the eastward.

The final flight of the season was made on February 1st, 1930, due south from the edge of the pack in 70° S. , 101° W. On this occasion Wilkins reached 73° S. and saw nothing except pack-ice and icebergs. He conjectured that the pack was fast to land to the southward.

Mr. Lincoln Ellsworth made two unsuccessful attempts to fly across the Antarctic Continent, but in a third effort, with the collaboration of Mr. Hollick Kenyon as pilot, he accomplished his object. The first few hours of that flight carried him over nearly the same track as Wilkins had followed in 1929.

Ellsworth took off from Dundee Island on November 24th, 1935, at 8 a.m. and flew southward along the east coast of Graham Land for 600 miles, rising eventually to a height of 13,000 feet, from which altitude Stefansson Strait was recognized but estimated to be only a few miles wide, but whether it connected the Weddell Sea with the Bellings-

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hausen Sea could not be ascertained. Instead of the gentle snow-slopes of Hearst Land an immense mountain range appeared below the plane with peaks bare of snow rising to 12,000 feet above the sea. This flight was made before the *Penola* reached the scene of her labours, but long after the historical note was written for the *Polar Record* of July 1934. In that article, however, the remark was made that, "Intensely interesting as the results of air reconnaissance always are in polar regions, they must be taken rather as suggestions for future exploration on the surface than as a basis for definite mapping. It would appear from experience in other parts of the Antarctic that aeroplanes can be of the utmost importance in scouting for exploring ships or discovering positions for possible winter quarters on land. When, but not until, machines are available which can land on and take off from a rough surface of land or ice, they will become available for all the purposes of exploration. Meanwhile, astronomical observations, without which no useful mapping is possible, must be made from the surface."

In fact, it would appear that neither from the air nor from the sea can the features of Antarctic land be accurately mapped in the course of flights or voyages. The conditions of visibility are so uncertain, and vary so quickly, that the estimations of distances and heights can only be accepted when checked and confirmed by detailed survey on the ground itself.

Before the British Graham Land Expedition went out, very little experience of exploration by land or over ice in West Antarctica was available to guide future explorers. Nordenskjöld's sledge journeys from Snow Hill Island were the most extensive, and Charcot's from Wandel Island and Petermann Island extending to the Graham Land coast were of some value. The only other attempt by the winter party of Cope's abortive expedition of 1921-22 was defeated by the impossibility of crossing the plateau from the shore of Andvord Bay, Danco Land, in $64^{\circ} 48' \text{ S}$. (See *Geographical Journal* (1923), vol. lxii. pp. 174-193.)

In conclusion, it may be noted that no earlier expedition has

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navigated the Bellingshausen or the Weddell Sea (though three have drifted there as prisoners in the ice) between the months of April and October inclusive. The only high latitude attained as early as November was by Evensen in the Bellingshausen Sea in 1893. On the Weddell Sea side Larsen made the highest latitude on the Oscar II Land coast on December 6th, 1893. With these exceptions, the Antarctic Circle in those seas has never been crossed before January, and that month and February have always been found the most favourable. In the Bellingshausen Sea the only ship which reached a high latitude as late as March 3rd was the *Belgica*, and she was frozen up in the pack. In the Weddell Sea, however, Ross and Bruce made their highest latitudes as late as March 5th or 6th and returned, though the *Deutschland* was beset on March 6th and the *Endurance* six weeks earlier.

The Falkland Islands Colonial Government is charged with the administration of South Georgia, all the sub-Antarctic islands of the South Shetland, South Orkney and Sandwich groups, as well as Graham Land with its off-lying islands and the Antarctic Continent between the meridians of 20° and 80° W. Except for South Georgia, where there are extensive factories for the utilization of whales, this vast area is entirely uninhabited. For a considerable time a factory operated on Deception Island and its harbour was occupied by factory ships, but since the full development of the system of pelagic whaling it has been deserted, though many of the buildings erected on shore remain standing and are going to ruin. The Government issue licences for the use of their territory, and a large revenue was derived in this way before the shore stations were abandoned in the outlying islands.

With the object of maintaining the supply of whales the British Colonial Office decided in 1919 to begin researches into the life-history of the larger Cetacea, and on the advice of a committee of scientific men and Government officials proceeded in 1923 to appoint the Discovery Committee to organize research and carry out the work on board the

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old wood-built *Discovery*. A few years later the old ship was superseded by *Discovery II*, a steel vessel equipped with the latest type of apparatus for oceanographical and biological research. A small vessel of the whale-catcher type was subsequently built with the object of marking whales, and she received the name of *William Scoresby*. Both of these Royal Research Ships have done brilliant service in sub-Antarctic waters, and have increased geographical knowledge by the precise survey of the ocean and the islands and the discovery of useful harbours. Neither vessel is suited for actual exploration amongst ice-floes, though they have made successful dashes to high latitudes. The preparation of accurate charts by their surveying officers must prove of great service to exploring ships, and the Discovery Committee has always shown itself ready to help explorers by advice and by providing means of transport in easily navigable waters. The Committee also kept for some years a small scientific staff in its research laboratory at Grytviken in South Georgia. The Colonial Office in administering the funds collected by the Falkland Islands Government has also taken a broad view of its mandate by contributing to the expenses of the British Graham Land Expedition, to the record of the work of which this chapter is an introduction.

CHAPTER ONE

FROM ENGLAND TO GRAHAM LAND

WHEN H. G. Watkins returned to England, after leading the British Arctic Air Route Expedition, he produced plans for sledging across the Antarctic Continent from the Weddell to the Ross Sea; but this was in 1931 when money was scarce, and although he tried every available source he eventually had to abandon the project. He did not entirely give up hope of visiting the Antarctic, but brought out different plans which covered the exploration of Graham Land only. After weeks of heart-breaking effort it became obvious that the funds, even for this much cheaper expedition, were not forthcoming. So, in May 1932, when Pan-American Airways offered him £500 to take a party again to East Greenland to carry on with the general investigations of the flying conditions there, he accepted their offer, and in July of that year, accompanied by F. Spencer Chapman, Quintin Riley and myself (all members of his previous expedition), sailed from Copenhagen on board the Danish Supply Ship. Soon after reaching Greenland, Watkins met a tragic death while out hunting in his kayak. This sudden loss left the three of us without the inspiration of our leader and friend, but we decided to carry on with the expedition and try to complete the task which Watkins had set us.

During that winter in Greenland I spent a great deal of time thinking out plans for an expedition to the Antarctic. The expedition was to be a modest one as I did not see how I could raise large funds. Briefly, the plan was: to be landed on the north-east coast of the Weddell Sea with two companions, and then spend two or three years travelling along and mapping the unknown shore-line at the back of the Weddell Sea until we eventually arrived at Nordenskjöld's old winter quarters on Snow Hill Island, which lies off the north-east coast of Graham Land.

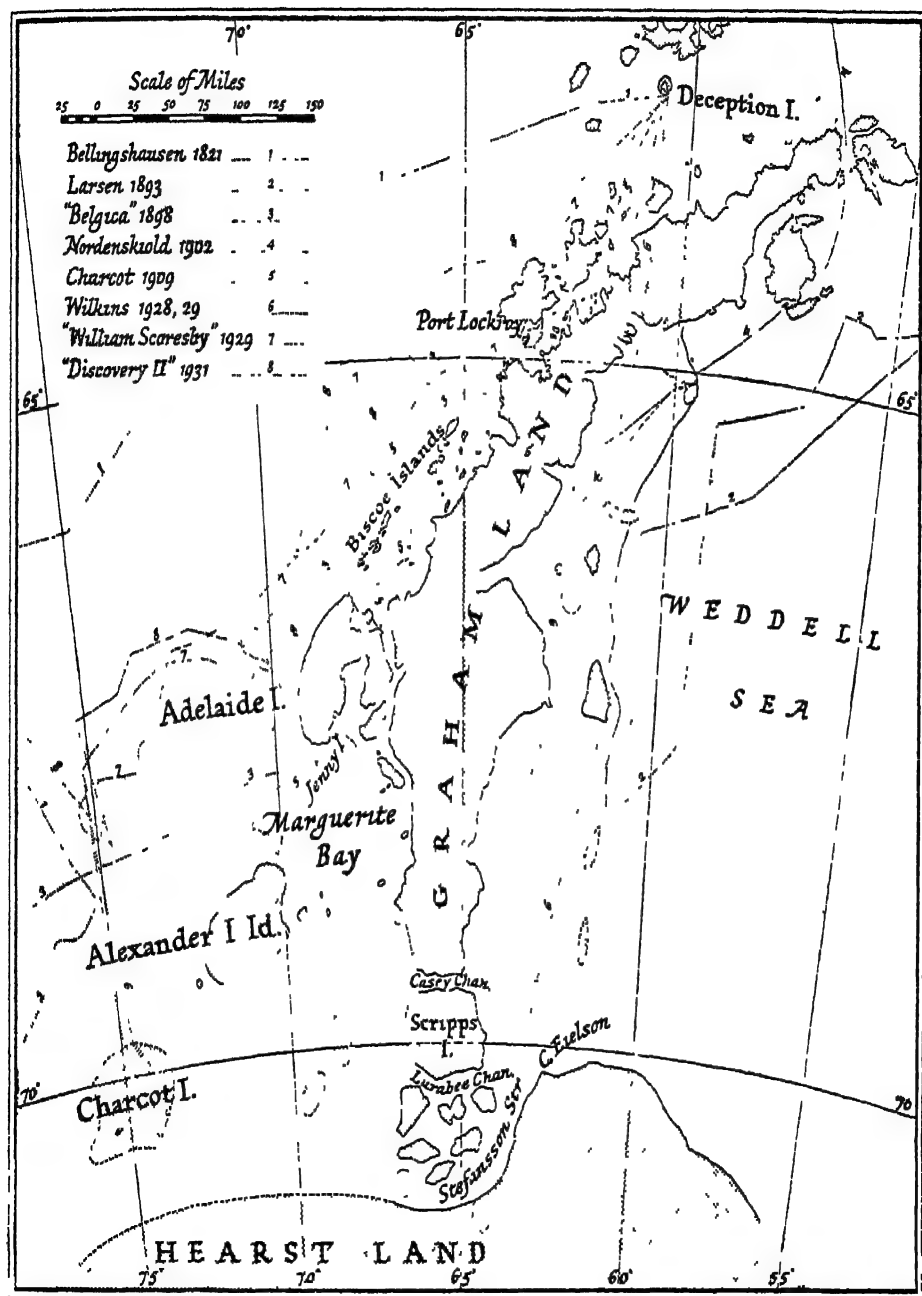
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On returning to England I spoke of my plans to Professor Frank Debenham and Mr. J. M. Wordie, two of the leading Antarctic authorities in the country. They approved of the general idea of taking an expedition to Western Antarctica, but they both thought that sufficient money for a larger enterprise might be raised, and Mr. Wordie proposed a different plan.

Map No. 1 shows that Western Antarctica had been left practically untouched by explorers, mainly because the heavy pack-ice made the approach to the coast by ships very difficult. The area we proposed to work in is enclosed on the map by dotted lines. This is British territory, and is called the Falkland Islands Dependencies.

Apart from the exploration of north Graham Land, no one except the German explorer, Filchner, in 1912, had succeeded in landing anywhere on what was thought to be the Antarctic Continent or its bordering shelf-ice in the Dependencies. Filchner had reached the south-east corner of the Weddell Sea but had not been able to carry out any exploration on land. Apart from his effort, enough ships, including Shackleton's *Endurance*, had tried and failed to penetrate to the southern limit of the Weddell Sea, to make it obvious that to push south on this side of Graham Land was quite unpractical. On the other hand, owing to the general movement of the currents in Western Antarctica, the pack-ice is forced against the east side of Graham Land but is carried away from the west side, leaving comparatively open water down that shore. Map 2 shows the tracks of expeditions which have worked along the Graham Land coast south of latitude 65°; north of this latitude the coast is easily accessible, and has been well known to whalers and explorers for many years. Only two ships had succeeded in penetrating inside the Biscoe Islands. These were Charcot's *Pourquoi Pas?* in 1908 and the *Discovery II* in 1931. Whalers working from Port Lockroy may also have come inside the Biscoes, but their reports are too vague to be relied on.

When aeroplanes became practical for polar travel, Sir Hubert Wilkins, as Dr. Mill has said, made the first Antarctic flight, which was a magnificent effort, in 1928; he flew from Deception Island 600 miles



Graham Land, showing routes of Expeditions up to 1934

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south, and so penetrated the vast unknown region of south Graham Land. He reported that south Graham Land was broken up by several channels running east and west, the largest of which he named Stefansson Strait, and the two to the north of it Lurabee and Casey Channels. Now, as has already been explained, it is unpractical to navigate in the Weddell Sea; but, as Mr. Wordie pointed out, Wilkins's report of these channels had opened up a new possibility for an expedition to work as far as possible down the west side of Graham Land, establish a base somewhere in Marguerite Bay, and then travel by dog sledge to the east through Stefansson Strait, and so explore the Antarctic coast behind the Weddell Sea. At the same time another party from the same base could explore to the west behind Alexander I Island and Charcot Island. This was what we proposed to do.

The plan met with general approval, and when it was put before the Council of the Royal Geographical Society at the beginning of 1934, they showed their approbation by making the generous grant of £1000 as a start to the expedition's funds. My name was unknown except to a few people specially interested in polar work, so that there was little I could do towards raising money. This difficulty was, however, overcome by the tremendous help given to me by Admiral Sir William Goodenough and Professor Debenham, and it was in fact entirely due to their efforts that the expedition became possible.

While waiting for enough money to begin the main work of organizing and outfitting, I started collecting the personnel. W. E. Hampton and Quintin Riley, both of whom were old friends from the British Arctic Air Route Expedition, had agreed to join the new venture when it was first suggested, and had given me valuable assistance in working out details—especially Hampton, whom I asked to be second-in-command, and also to take charge of flying. Although he was only 26, he had had considerable experience both in polar regions and with aeroplanes. He had studied aeronautical engineering for three years at Cambridge, and then worked for a further year with De Havillands. This firm recommended him to Watkins, who was looking for a man

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to take to Greenland as ground engineer in charge of the expedition's two Gipsy Moths and also as second pilot. On returning from Greenland Hampton joined the staff of Vickers Ltd., but left to come to the Antarctic. He and I had been together a great deal in Greenland, for we had spent most of the winter repairing the aeroplanes, both of which were badly damaged by gales. Then at the end of the expedition we had sledged together across Greenland from our base near Angmagssalik to the west coast, so that I was well able to judge his worth, and believed it would be impossible to get a better man for the difficult position of second-in-command of a prolonged polar expedition.

Quintin Riley had been meteorologist on the British Arctic Air Route Expedition, and also on Watkins's second expedition to Greenland. On this new one he was to be commissariat officer and one of the two meteorologists, but his most important duty was to be the charge of the two boats belonging to the shore party.

The other members of the British Arctic Air Route Expedition who joined me were A. Stephenson and Surgeon Lieutenant-Commander E. W. Bingham, R.N. Stephenson had been chief surveyor with Watkins, and since then had spent a year at Fort Rae in the Canadian North-West Territories as a member of the British Polar Year Party which was carrying out meteorological work there. He was to be our chief surveyor and meteorologist.

Bingham had been doctor on Watkins's expedition, and at the moment when I asked him if he would come to the Antarctic as doctor and also to be in charge of the sledge dogs, he was serving with H.M.S. *Challenger's* winter survey party in Labrador. The Admiralty appointed him to the expedition, and gave him permission to sledge south down the Labrador coast, thereby enabling him to get an early ship back to England and so arrive before we sailed.

In entering a completely unexplored country, as we were hoping to do, it was a tremendous help to know that I had the support of these four companions who were all experienced polar travellers and whose judgment I greatly respected.

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The other members of the shore party were as follows : The Reverend W. L. S. Fleming, Dean, Chaplain and Fellow of Trinity Hall, Cambridge, joined us as chaplain, chief scientist and geologist. He had had two summers' experience in the Arctic; one spent with the Cambridge Expedition to Vatnajökull, Iceland, in 1932, and the other with the Oxford University Spitsbergen Expedition in 1933. B. B. Roberts of Emmanuel College, Cambridge, who was our ornithologist, had led the Cambridge Expedition to Vatnajökull in 1932 and had also spent a summer in East Greenland; and J. I. Moore of St. John's College, Cambridge, who had read engineering, joined us as second engineer and surveyor. His previous polar experience had been a summer spent in Spitsbergen. The War Office generously lent the services of I. F. Meiklejohn, Lieutenant in the Royal Corps of Signals, who was in charge of our wireless. He had not previously worked in polar regions, but had spent some time in Canada attached to the Canadian Air Force, where he gained useful experience. I completed the shore party in the capacity of surveyor, and since I had also had a little flying experience I could, if necessary, act as second pilot. I had been with Watkins on both his Greenland expeditions as surveyor, having studied under Mr. Reeves at the Royal Geographical Society.

In February 1934 the Colonial Office decided to make the expedition a grant of £10,000, which made it possible to start the work of organization. Time was short, for if we were not to miss the open season in the Antarctic we should have to sail from London in five months' time. Not that there was insufficient time to outfit the expedition adequately, but the longer one has, the more time there is to spend on making business connections and getting introductions to firms, thereby greatly reducing the cost. However, with the limited time at our disposal I was still able to do a good deal of this sort of thing, and was surprised and pleased by the kindness, courtesy and generosity which I received from most of the firms I approached in my efforts to get something for nothing.

A long description of our outfitting would only bore the general

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reader, but as we were the first British expedition to winter in the Antarctic for over twenty years (with the exception of Bagshawe and Lester, who spent the winter of 1921 in north Graham Land), a brief account of some of the most important items of our equipment, especially where they vary from those of the earlier expeditions, may be of interest. The things which had to be dealt with at once were the sledge dogs and sledges, the aeroplane, the house for the shore party, and the ship.

The most expensive parts of an Antarctic expedition are the buying, outfitting and maintenance of a ship. These I proposed to cut down to a minimum by buying an old sailing ship with auxiliary power and running it with amateurs except for the Captain and Chief Engineer, who were Naval Officers. Even the Captain, therefore, although an experienced and efficient navigator, was virtually an amateur in sail. As we were contemplating a three years' voyage, this scheme was, naturally, a formidable undertaking and met with a great deal of criticism from seafaring men. However, I heard no difficulty suggested which I was prepared to believe insuperable, and since it was a question of taking an amateur crew or not going to the Antarctic at all, there was no alternative as far as I was concerned. In looking back on the expedition now that it is all over, it is apparent that the amateur crew had obvious disadvantages in the beginning, while they were still new to ships and the ways of the sea, but later they did their work well and safely under conditions which would have taxed the best professionals. Also, although educated men cannot be expected to have the same interest as ordinary sailors would have in the dull maintenance work, during the winter months which our ship spent in the Antarctic they were far more adaptable to uncomfortable conditions and strange food. In fact, I have the greatest respect for the only two members of the ship's party who were not specialists and were therefore called upon to do most of the dull and unpleasant work. If the occasion arose again, I should not hesitate to carry out the same system, for, judging by results, it has proved itself to be a sound one. During the voyage,

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which lasted for 2 years and 11 months, this amateur crew, besides carrying out the maintenance work, which is always heavy on an old wooden ship, covered a distance of 26,896 miles; 15,496 under sail alone, 3040 with engines, and the remainder under a mixture of the two.

At the beginning of the expedition the crew consisted of Lieutenant R. E. D. Ryder, R.N., Captain; Lieutenant-Commander H. Millett, R.N., Chief Engineer; J. H. Martin, First Mate; Captain L. C. D. Ryder of the Royal Norfolk Regiment, Second Mate; G. C. L. Bertram, Biologist and sailor; Norman Gurney, sailor. L. C. D. Ryder, the Captain's brother, besides being the Second Officer, happened to be an extremely efficient carpenter, which was a most useful accomplishment for carrying out maintenance work on the ship. Bertram of St. John's College, Cambridge, was a member of the Cambridge Zoological Expedition to Bear Island in the summer of 1932 and had been in East Greenland with Roberts in 1933. The only other member of the ship's party who had had previous polar training was J. H. Martin, who had sailed with Mawson on the British, Australian and New Zealand Antarctic Research Expedition in the summers of 1929 and 1930, and had also had a little sledging experience in the Canadian North-West Territories. During the voyage south and at other times whenever possible, the shore party also worked as ship's crew.

Buying the ship was not an easy matter, for although the Expedition Fund had now been increased by many generous supporters, we could not afford to give more than £3000 as a purchase price. After looking at a great number of ships which were either too expensive or too rotten, one was eventually found which, if it passed the survey, should suit our purpose. She was an old French fishing schooner that had recently been converted into a private yacht. Anyone who has been to St. Malo in the winter will be well acquainted with the type, for there are still a number there which make an annual trip across the Atlantic to the cod fisheries in Newfoundland. They are a heavy lumbering type, built very strongly with an outer and inner hull. They have a large carrying

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capacity for their length and are very bluff forward. With a fair wind they are comfortable and dry, and in bad weather will heave to splendidly. The particular one which we were considering was built in Brittany in 1905, and is 103 feet on the water-line, with a 24-foot beam, and draws 14 feet aft; her gross tonnage is 130 tons. As soon as I decided that she would suit our requirements I put her in the very capable hands of the ship surveyor, Mr. William McC. Meek. He carried out a hasty but adequate survey (being much hampered by lack of time and money), and reported her sound enough for the work in hand. I bought the ship, renaming her the *Penola* after my home in South Australia, and Mr. Meek immediately set about the task of outfitting and strengthening the hull for work in pack-ice. The rig, which we left practically unaltered, except for one change made later on, was that of a three-masted topsail schooner, carrying a single square topsail on the foremast and a large square sail beneath, which we could hoist from the deck. The square topsail was fitted with roller reefing; this enabled us to roll up or unroll the sail from the deck in the manner of an ordinary blind, and this device, in spite of a prodigious number of chains and blocks, proved a great success when we eventually mastered it. The mainsail and mizzen were both fitted with roller booms, which was a great advantage when reefing down in cold and stormy weather.

The engine power was the greatest source of worry, for the *Penola* had two propellers, the previous owner having installed two 50-horse-power Junker Diesel engines. Apart from the fact that a full Diesel engine is not the best type for polar work, two propellers are a great handicap, for they stick out from the sides of the ship and are very liable to become damaged while manœuvring through pack-ice. We went into the question of removing these engines and putting in their place a semi-Diesel, driving one central propeller, but the expense was much too great. However, Mr. Meek designed some steel propeller guards which we took with us to fit if necessary.

The work done to the hull mainly consisted of strengthening the bow, fitting some cross-bracing in the hold and sheathing the outside of the

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ship with greenheart from the bows to just aft of amidships. The sheathing should of course have been carried right round the stern, but again lack of funds made this impossible.

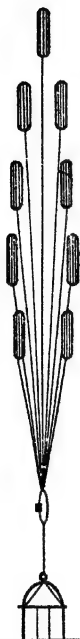
Little more need be said about the outfitting of the *Penola*, as a polar ship's equipment is much like that of any other ship of the same type, except for the addition of ice-anchors, ice-saws and chisels, and the use of graphite grease instead of ordinary grease to prevent the blocks and other moving parts about the rigging from freezing up. Perhaps the most important of all the items of equipment are particularly heavy anchors and anchor chains and a good supply of steel wires and warps for holding the ship safely in small rock-infested anchorages during Antarctic gales.

After careful consideration we decided to use dogs for general ground transport instead of tractors, which, in my opinion, are quite unpractical when used as an expedition's sole form of transport. Not only are they useless when travelling over rough and broken sea-ice, but for obvious reasons they cannot be used in a mountainous and much glaciated country where bad crevassed areas and ice-falls are common. Also, when working at slow speed over rough country their range at present is very much less than that of a dog team. On the other hand, dogs are wonderfully adapted for all Antarctic conditions and, apart from actual rock-climbing, can go anywhere where man can go.

Our first consignment of 65 dogs was collected by F. Spencer Chapman in West Greenland, but as most of them died of distemper on the voyage to the Antarctic we were compelled to collect reinforcements. There being no opportunity of getting more from Greenland, we bought a second lot of 34 animals, with a good percentage of breeding bitches among them, in Labrador. These had to be bought hurriedly through an agent, and though some of them were magnificent specimens, many were very poor, some even dying of old age during the expedition.

When entering an unexplored region in the Antarctic, where there are of course no natives to act as guides, the method in which the dogs are going to be driven should be considered with as open a mind as

British Graham Land
Expedition Method

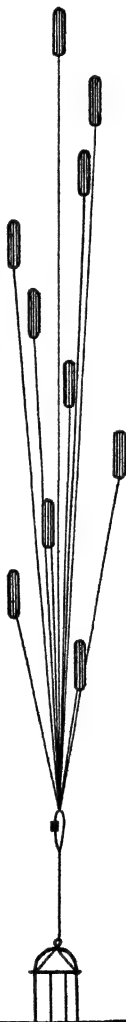


Centre Trace

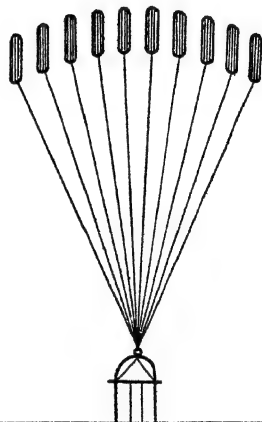


METHODS OF DOG DRIVING

Long Fan



True Fan



Tandem



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possible. There is no best way of driving dogs, as each of the many different methods used in the north has been gradually developed to suit local conditions. These methods can be grouped under four main types and are best shown in diagram form.

We made no attempt to decide on any definite method until we had seen local conditions, but went prepared to adopt any one except tandem, which is only of advantage in thickly wooded country.

When we eventually reached Graham Land we found that we would be driving over thin, treacherous sea-ice and on much-crevassed glaciers in a country where the snowfall is heavy for most of the year. The centre trace method was therefore ruled out, as it is most dangerous both on thin ice and among crevasses. For if a team falls through the ice, the dogs' movements are much too restricted by their short traces, and they become hopelessly tangled while trying to swim to safety; moreover, if one dog breaks through, the one directly behind is probably dragged into the same hole, as his trace is too short to let him run round it. This also applies to snow-bridges over crevasses where, if the leading dogs break through, their weight hanging on the centre trace will almost certainly pull all the rest down. Another bad situation where the centre trace method is concerned is when it becomes necessary to cross small open leads in the sea-ice or open tide-cracks where the dogs bunch together before jumping. In this case the centre trace almost invariably becomes tangled, causing them to miss their jump.

The fan methods have none of these disadvantages, but the true fan is unpractical in Graham Land, for as each dog must make his own trail, it is essentially a method to be used on hard surfaces. Besides, in travelling over the hummocky and broken sea-ice which is often met, it is only possible for the dogs to run two abreast; so we come down to the long fan, which is mainly used in Labrador. In this method the dogs are on separate traces, each one varying by about 6 feet, which means that when the surface is heavy they can fall into single file. But a further point that we had to consider was the question of dogs losing heart and becoming lethargic on long, monotonous journeys. Huskies

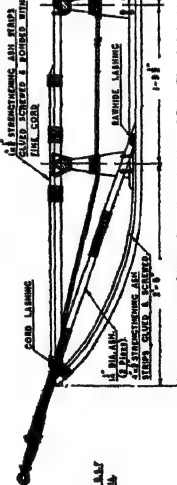
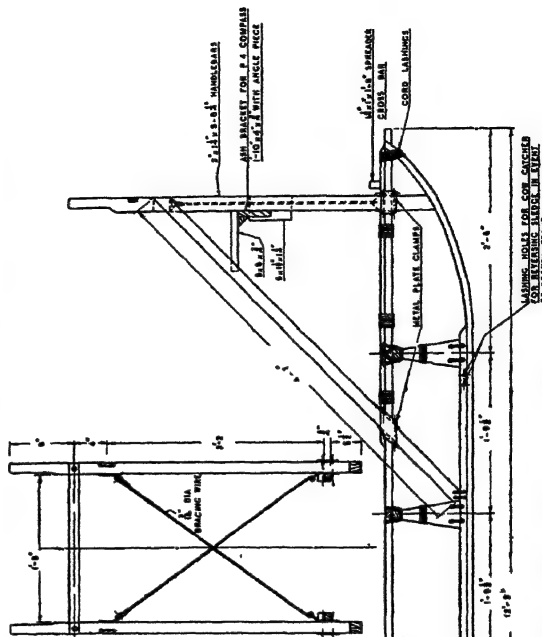
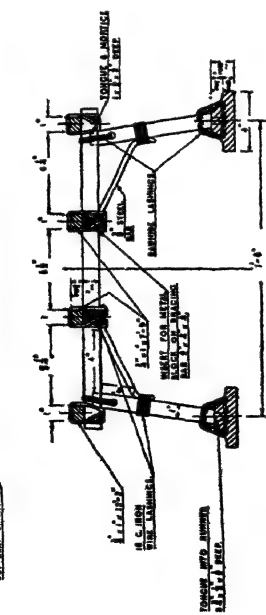
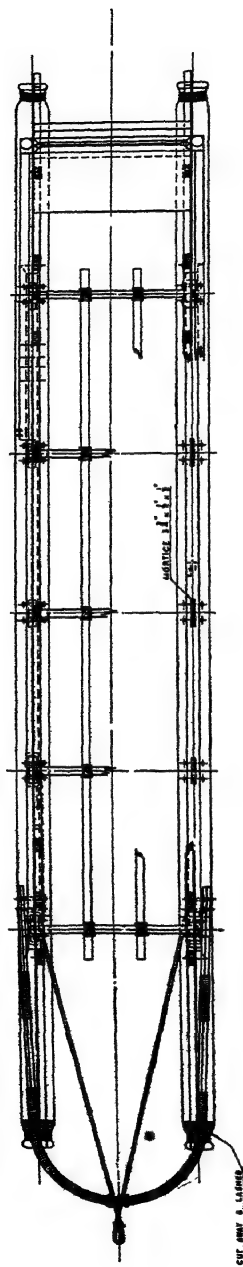
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form strong attachments for each other and need companionship to keep up their spirits, so we eventually decided on a modified version of the long fan and drove our dogs on separate traces but pulling in pairs, with either one or two leaders according to personal taste.

Attached to the front of the sledge we had a 6-foot leading trace to which the individual traces were fastened; the first pair of dogs were on 12-foot traces, which meant that they were 18 feet from the sledge, thereby giving the driver plenty of room for manœuvring. The rest of the pairs were spaced out at intervals of 6 feet, which put the leading pair in a ten-dog team 42 feet from the sledge. We found this system well adapted to the Graham Land conditions, and well received by both the Greenland and Labrador dogs.

A question of equal importance was that of material to be used for traces and harnesses. Between us we had used most types of harnesses, for the expedition included men who had wintered in Greenland, Labrador and the Canadian North-West Territories. As none of us had any marked preference, we went equipped with webbing, canvas, lamp-wick and rope for making harnesses, and various types of cord, log-line and rope for traces.

No type of sledge that is in general use could be used under the conditions we expected to experience. For it was essential for us to have a sledge strong enough to carry a reasonable load over sea-ice, yet light enough to be carried by one man when negotiating ice-falls or rocky mountain-sides. To meet these requirements Hampton and I designed a sledge, which proved on trial rather too weak for rough sea-ice, but later, after Hampton had altered the design and reconstructed it, we arrived at a good general-purpose sledge, weighing about 70 lbs. when fitted with handle-bars, and having the type of brake which is in general use in the Central and Western Arctic. The construction of these sledges is very simple and can easily be shown in a scale drawing. The runners were made of Norwegian hickory, and all the other wooden parts of ash; the lashing was done with either raw hide or silk kite cord. Besides these sledges we took two solid-framed iron-shod ones which we



NANSEN TYPE SLEDGE AS DESIGNED AND USED BY B.G.L.E.

1934-1937.

SCALE OF FEET.

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used mainly for puppy training and general work round the base, so saving the more expensive ones for the main journeys.

Our funds limited us to one aeroplane only, and this had to be a single-engined machine, as there were no twin-engined ones at the price which we could afford to pay. As a result, great care had to be taken to choose a machine which was equally good as a seaplane and as a ski-plane, with quickly interchangeable undercarriages, and one which would combine as many of the most essential qualities as possible. The first essential was wooden construction. Many people, qualified to give an opinion, will say that wooden construction is not suitable for service in cold climates, but Hampton found it extremely good during eighteen months' hard service in Greenland, and again after two and a half years in the Antarctic in much more severe conditions. Its chief advantage on an expedition is the ease with which even major repairs can be carried out. It is not necessary to take a comprehensive supply of air-frame spares, as these can all be cut straight from a length of suitable timber, and even main and tail plane ribs can be constructed with a little patience.

Another important point for us was a quick take-off, both as a seaplane and as a skiplane, accompanied by a slow landing speed with the ability to land in very confined spaces.

Other considerations were the pilot's forward view while on the ground; cabin space; facilities for relieving the pilot in the air; folding wings for convenient housing; general suitability for rough handling; and heating of the cabin and cockpit.

The De Havilland Fox Moth had most of these requirements, with the added advantage that it had been used successfully in the north of Canada in conditions which are in many ways similar to those we expected to meet with. The two drawbacks to the machine were: first, the very poor forward view the pilot would have when taking-off, particularly on floats; this would necessitate the thorough examination of the track the aeroplane was intending to use before every take-off; secondly, the fact that the pilot could not be relieved in the air, nor

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could dual control be fitted to the machine, as the pilot sits behind and above the cabin. The cabin, which could take two passengers, was adapted for either an Eagle III electrically operated automatic survey camera or for an additional petrol tank. The normal range of the aeroplane was $5\frac{1}{4}$ hours, or approximately 450 miles in still air. This range could be doubled if necessary, but only when the take-off was from the skis.

A few slight alterations had to be made to the machine. All the main fittings were attached with stainless-steel bolts, but for some reason, probably known to the manufacturers, very few stainless-steel washers were used. Handholds were cut in the bottom plane wing tips for easy handling and tethering, and the bottom plane leading edges were ply-covered, a most necessary precaution when the machine is likely to be roughly handled. Moreover, unless this is done, ice thrown up by the airscrew is liable to puncture the fabric. A special dope process was used on the fuselage and on the leading edges of all the main planes, and tail and fin, to assist in the prevention of ice-formation in flight. The Gipsy Major 130 h.p. air-cooled engine had an extra fitting attached to the carburettor intake so that, except at full throttle, warm air was collected from against the crankcase. This, besides preventing ice-formation in the intake and choke tube, allowed the engine to function perfectly in the coldest weather. Apart from this, only standard alterations were made to the engine for use in a seaplane. The floats were made by the Fairchild Aircraft Company of Canada and were of composite wood and metal construction with large stuffed leather bumper pads on the nose. The composite construction is very good for work in loose ice, which one is constantly pushing one's way through, when taxi-ing to and from open water, or when beaching on rough pebbles. They are certainly rather heavier than the standard English type, but more than make up for this by the way they withstand really hard knocks, for after $2\frac{1}{2}$ years' use there were still no leaks and very little corrosion, in spite of the machine having been in the water for periods extending to four or five weeks at a time.

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Our house and hangar, which was all one structure, was a new departure for the Antarctic, as we decided on a two-storied building. The house had double walls insulated with asbestos reinforced aluminium foil, which is a highly reflecting metallic material and which proved most satisfactory. Besides lining the walls and roof with it, we covered the ceiling of the downstairs room; this not only made the room much lighter but had a very cheerful modernistic effect.

The house consisted virtually of two large rooms each measuring 22 feet by 15½ feet, with a porch added on in front. The downstairs room served as a workshop, kitchen and dining-room, with one corner partitioned off to form an office for Meiklejohn's wireless. There was no ordinary heating stove, but an Aga cooker, though insulated, gave ample warmth except in the coldest weather, when we used two petrol heaters as well. A ladder resting against an open hatch in the ceiling led to the living-room and sleeping-quarters above. This upstairs room had walls 4 feet high and a steeply pitched roof which gave ample head space over most of the room. Round the walls were arranged 9 bunks, while a Sun-Glow stove, a table, 7 canvas chairs, and a book-case were the main items of furniture. A roomy loft above provided space for the storing of camping equipment and perishable things that could not be left outside or stored in the cold hangar.

This two-storied house proved a great success. All the odd expedition equipment such as small-boat tackle, ice-chisels and heavy outdoor clothing, which usually finds its way into the living-room, adding greatly to the discomfort of the occupants, could be kept downstairs; this made it possible to keep the upstairs room clean and tidy, with plenty of space for everyone, while a blue tablecloth, curtains, and strips of carpet on the floor gave a cheerful and bright appearance—in fact, when sitting in front of the stove after dinner with a good book, it was easy to forget that one was in the Antarctic at all.

Preparations went forward steadily without any major mishaps other than the distressing loss of our magnificent Greenland huskies, and after the usual last-minute delays—in our case caused by the necessity for

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altering the oiling system of the *Penola's* engines—we sailed from St. Katharine Dock, London, on September 10th. There were 13 men on board, including a Falkland Islander who wished to return home and was working his passage as cook until we reached Port Stanley. Of the other three members of the expedition, Hampton and Stephenson had left some months before by cargo boat for the Falkland Islands, while Bingham was waiting behind to bring on the new consignment of dogs, which had not yet arrived from Labrador.

After dropping the pilot at Gravesend and saying good-bye to the few friends who had come down the Thames with us, we were soon out in the Channel and on our way to Madeira—the first lap of the long voyage to the Antarctic. A large deck cargo made the little ship look terribly overloaded, though really she was fairly lightly laden, for a great deal of the space below was taken up with living-quarters and engine-room, which cut down the size of the hold, and although every available space was packed, we still had several feet to spare before the water would reach the loading mark.

Besides all this general cargo, the deck was the home of our livestock, which at the outset included several crates of fowls, two half-grown pigs and two Greenland huskies. These dogs were veterans of Watkins's last expedition which we had brought back to England, where they had been housed at the London Zoo until they joined the *Penola*. The dogs and pigs had the free run of the deck, and after a short time completely ignored each other. When they were first introduced, the huskies came up to inspect the new, strange-looking animals, but when the pigs grunted at them they retired hurriedly, and ever afterwards, until the pigs were eventually turned into a fresh-meat supply, went out of their way to avoid them. The pigs, which for some strange reason came to be known as Gladys and Denis, would generally be found near the ventilator leading from the galley, where they could smell the cooking and occasionally get titbits poked up to them on the end of a fork.

Fortunately the weather was calm for the first few days of the voyage, giving us a chance to settle down in our new and, for many of us, strange

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surroundings. We were divided into two watches; each watch had 4 hours on duty and 4 hours off, which meant working a 12-hour day and never getting more than about 3 hours' sleep at a time. This was an unnecessary strain on men who were not used to it, so we later changed the watches to periods of 6 hours instead of 4, and this proved a much better plan.

As the days passed by, and especially during some blustery weather in the Bay of Biscay, we were able to get an idea of the qualities of our ship. Mr. Meek had predicted that the sheathing and alterations to the bows would take away from her performance as a sailing ship, and this we found to be the case. In fact, if there was any sea running she would not come about under sail, and on occasions even failed to do so when helped by the motors. This often made it necessary to gybe, and always gave one an uneasy feeling when anywhere near a lee shore. Nevertheless the *Penola* proved herself to be a good sea-boat, both dry and comfortable, though her most enthusiastic supporters could not call her speed reckless. Under engines in calm water, when her bottom was clean as is the case when in the cold Antarctic water, she would do about 6 knots, but if there was any head-wind this would be greatly reduced; while under sail in a fair breeze she would go along at about $3\frac{1}{2}$ to 4 knots, though on one occasion, with sails, engines and a following gale, she actually logged 9. These speeds appear slow when judged by modern standards, but actually compare favourably with the other wooden ships which have visited the Antarctic.

We arrived off Funchal, Madeira, on September 24th and hove to for the night, going into the bay the next morning. Everyone on board was glad of the chance to stretch his legs on shore after the fortnight of unaccustomed confinement in the ship, so although our business, which consisted of telegraphing to England for some extra wireless parts and buying fresh fruit and vegetables, was completed in a few hours, we decided to spend the day there, not leaving until 7 o'clock in the evening.

On leaving we hoped to pick up the trade winds which would carry

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us on our way to Montevideo, but these proved feeble or altogether lacking. This made it necessary to use the engines more than had originally been intended, and put an undue strain on them, as they were only meant for auxiliary power; but by combining them with the sails we managed to cover a good hundred miles a day. By this time everyone had settled down well and the work on board went steadily on. During the day the watch on duty was kept busy at general work, which, besides ordinary repairs to the rigging, included oiling what could be seen of the deck, overhauling and greasing all the blocks with graphite grease, renewing the ratlines, patching and repairing old sails so that our new ones would be in good condition for the Southern seas, and 'blacking down,' an unpleasant pastime which means covering all the metal parts of the rigging with a solution consisting mostly of Stockholm tar. As the 'blacker down' usually finds himself suspended in a bosun's chair immediately underneath his work, the shortage of fresh water on board for washing soon became obvious. A great part of the work which we were doing could of course have been done in England by professional riggers, but this would have cost money, so anything which could be left until we sailed was done by ourselves on the outward voyage. Martin soon proved himself a real expert at all this kind of work, and so tactful and patient that he won the respect and confidence of everyone on board.

After some weeks, handling the sails by day became a fairly simple business, but the same work by night was quite a different proposition, for, apart from the difficulty of balancing oneself on a swaying and pitching ship in a bad light, practically the whole deck was strewn with a conglomeration of odd-shaped cases and drums which made the execution of an order to make or shorten sail like an obstacle race in the dark.

Once we were in the calm, tropical weather, however, the night watches, except for the man at the wheel and the officer on duty, who always had to be alert and wide-awake, were spent lying on anything comfortable that could be found and looking at the stars, or else sleeping

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on a pile of coal sacks on the poop, and only getting up to take turns at the steering.

We arrived at Montevideo on November 11th and were met by our most efficient agents, Messrs. Maclean and Stapledon, who informed us that Bingham had arrived with the second consignment of dogs on October 29th. Our original intention had been to pick them up here, but as a ship was leaving for the Falkland Islands shortly after Bingham arrived, he wisely decided to go on at once and get his charges ashore at Port Stanley as soon as possible. There was nothing to keep us at Montevideo, so after collecting fresh water and vegetables, and doing one or two small jobs to the rigging that could not be done at sea, we left on November 14th. After a slight delay caused by head-winds we arrived at Port Stanley on November 28th. Hampton, Bingham and Stephenson came off in the Government launch to meet us, and gave us the good news that the 15 survivors from the 65 Greenland dogs were in good condition and that Bingham had had a very successful voyage, losing only two of his dogs on the way. His task had been a difficult one, and his own description of it may prove interesting:

“As Rymill has already said, the expedition sailed from London in mid-September, leaving me behind to bring out the second lot of dogs, which arrived in Liverpool on October 4th, where I took over charge from Abe Ford the trapper, under whose supervision they had travelled from St. John's. Huskies are strongly built, well-proportioned animals, with broad, deep chests and powerful shoulders, which suggest that their parents must have been a cross between the Chow and the Wolf, but without any uniformity of colour. Fast, furious fighters when roused, a general mêlée between teams makes an impressive sight, but to humans they can be as affectionate as the best-trained house dog.

“So as to have no repetition of the distemper scourge which had such serious results, the question of inoculation was gone into thoroughly. At first it was thought that the cost would be prohibitive, but

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Dr. O'Brien of the Wellcome Physiological Research Laboratories very kindly came to the rescue, supplying us with the materials free of all charge, and Major Dalling, the Head of the Veterinary Department, kindly came up to Liverpool where he inoculated every animal.

"The dogs looked a wild lot when let loose on board the S.S. *Natia*, but Major Dalling quickly installed his phials and syringes in one corner, while I caught the dogs separately and brought them for operation. Abe Ford meanwhile kept the clean from the unclean. Although there was no time to prepare the animals in the usual way, there were no after-effects with any of the 35 dogs in the pen.

"The *Natia* was due to sail for Buenos Aires on October 6th, so that arrangements were somewhat rushed. I was, however, able to contract for a horse carcase at 1½d. a pound, and so gave the animals a good meat meal their first night in Liverpool. It was an encouraging sight to see the eager healthy way in which they polished off this meal, as their trip across the Atlantic had been made under very cramped conditions, the dogs having travelled three or four in a crate in a small compartment in the fore-peak of the ship. Luckily the *Natia* was fitted for carrying chilled meat, so the remainder of the horse was kept in good condition.

"The morning of October 6th, 1934, saw us under way, the ship unobtrusively sliding through dock after dock on its way to the open sea, the dogs little knowing the strange lands they were to visit within the next two years. Their main diet on the voyage was dried Norwegian stock fish, of which they received a half fish daily, after it had been soaked to soften it. In addition they had two small meals from the remainder of the horse on cool days. This low diet, coupled with as much fresh water as they wanted, kept the animals thin but healthy throughout their long hot voyage.

"The pen was hosed out every morning, prior to which the dogs had been stirred up and made to take exercise so as to encourage evacuation. It was again hosed out after their meal, which was given in the comparative cool of the evening, and as before, the

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exercise stimulated intestinal activity. In this way the floor of the pen was thoroughly clean all day and night, except just before the hosing.

“Shortly after reaching the hotter latitudes the dogs’ feet began to get tender, and soft inflamed swellings appeared between the toes. This condition was traced to the salt drying on the planks after the hosing, so each time the pen was hosed out a squeegee was used, then all the remaining fresh water in the drinking tubs was flooded over the floor and the squeegee used again. In a few days the sore feet began to improve and soon all was well.

“On arrival in Montevideo the dogs had to be transferred to a lighter in the harbour, as they were not allowed ashore. Owing to the heat in Montevideo the conditions on board the lighter, which was of the well type, were very trying, while the problem of cleaning also became more difficult, so that it was very welcome news to hear that a ship was calling en route for the Falkland Islands. This ship, the S.S. *Lautaro*, had no sooner dropped anchor in the outer harbour than a carpenter, complete with wood, was on board erecting a pen for the dogs, and by evening we were at sea again. The efficiency of the arrangements for this unexpected transfer, and the speed with which they were carried out, was due to the energy displayed by the expedition’s agents, to whom we owe much for their disinterested generosity.

“Unfortunately this trip was a lengthy one. We took three weeks to reach Port Stanley, as the ship was detained for a fortnight at Bahia Blanca, unloading bridge work and refilling with a cargo of wheat, and it was not until November 21st that we arrived at the Falkland Islands with all the dogs in passable health, except the two that had died on the passage.”

H.M.S. *Exeter* and R.R.S. *Discovery II* were at Port Stanley when the *Penola* arrived, and both gave us valuable assistance, for which we were very grateful. With the help of working-parties from them we set about

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altering the rig of the *Penola* to one more suitable for working in the ice. To facilitate motoring and manœuvring we reduced the windage by sending down the yards and two of the topmasts, but keeping the main topmast, which carried our crow's nest. Besides this we shortened our bowsprit by sawing most of it off, only leaving enough to carry two head-sails. These alterations very materially increased our efficiency as a motor ship as, apart from reducing windage, it trimmed the ship more by the stern, giving the propellers a better grip and protection from the ice.

While this work was going on the two engineers, Millett and Moore, started stripping the engines, to make a thorough examination of them after the long voyage from England. The *Exeter* and *Discovery II* left soon after we arrived, but by the courtesy of the Discovery Committee the *Discovery II* took on board the greater part of the equipment which had come out by cargo boat, including the aeroplane and sledge dogs, which she landed at Port Lockroy in north Graham Land. This arrangement, which had been made in England before we left, was a tremendous help to us, for it meant that when we sailed across the stormy Southern Ocean we should not have the added danger of being overloaded—a factor which worries most polar ships. The *Discovery II* sailed on December 2nd with Hampton and Bingham on board, their job being to look after the dogs both on the ship and at Port Lockroy until we arrived.

Captain Nelson of the *Discovery II* also very kindly allowed us to take one of his sailors, V. D. Carse, a Public School boy who had joined the *Discovery II* in England, working first as a deck boy and later as an Able Seaman. This was a great help, as we considered, after the experience of the voyage out, that a ship's party of six would be insufficient when handling the *Penola* unsupported by the shore party.

When the engines had been taken down, Millett's report was not encouraging. The engine-beds had been put in the ship before we bought her, and they must have been made of unseasoned wood, for on the voyage through the tropics they had warped and split badly, making

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the engines shift out of alignment, and causing bad wear in the gear boxes. However, with wedges and shores L. C. D. Ryder and the two engineers set to work and made a good attempt at overcoming the difficulty.

With all the work on the engines and rigging, as well as being held up by financial troubles in England, we were not able to leave Port Stanley until New Year's Eve. Throughout our stay in this wonderfully hospitable colony we met with every possible kindness, especially from Mr. George Roberts, the Director of Public Works, who did everything he could to help us.

As soon as we got clear of the Islands, on the day we sailed, we ran into stormy weather, with a heavy sea. After a few hours Millett discovered that the engines had again shifted, and were running out of line. We decided to put back into some suitable anchorage and make a further examination. Accordingly, the following day, just as it was getting light, the *Penola* arrived off Port Harriet, a harbour on the east coast of the Falkland Islands, and favoured with a fair wind we were able to sail in and anchor. Millett immediately set about examining the cause of the trouble and found that the bracing holding the engine-beds was not adequate in the rough sea which we had met. The only thing which he could suggest was the rather drastic act of blocking the beds in solidly with reinforced concrete, grouted in all round them after they had been trued up. This would take some time, and we were faced with two alternatives: either to carry out repairs in the Falkland Islands, which would mean missing the open season in Graham Land and not getting south until the next summer, or to disconnect the engines and carry on under sail alone, reconnecting the engines again when we entered the sheltered waters in the channels of north Graham Land, and then carrying out repairs ourselves during the first winter. We were in wireless communication with the *Discovery II* and knew that they had not yet landed Hampton and Bingham at Port Lockroy, so their situation did not influence any decision. But to spend a whole year waiting to get south was a dreary prospect. The early sealers and

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whalers, as well as exploring ships, had sailed in the Antarctic before the days of steam, and I could see no reason why we could not do the same. Ryder was in agreement with me, so I had no hesitation in making the decision to disconnect the engines and leave under sail alone as soon as possible.

We were stormbound in Port Harriet for a few days, but as soon as the weather cleared we coasted round to Port Stanley, where we bought the necessary amount of cement.

We sailed again on January 7th on the last lap of our voyage—a distance of about 900 miles across the westerlies south of Cape Horn to Graham Land itself. That 900 miles was measured as a straight line on the map, but the distance which we would cover under sail alone before we reached there remained to be seen. As we were sailing practically straight across the belt of prevailing westerly winds, we did not expect to be carried far off our course, and in this our judgment proved to be correct, since, in fact, we were delayed by lack of wind rather than by too much of it. There was one hard blow which lasted for a day and a night only, but was sufficient to give those of us who had never seen a really big sea from the deck of a small ship some idea of what the Southern Ocean could do if it really tried.

On January 21st we picked up the westernmost island in the South Shetland Group, and passed between it and a fine tabular iceberg, the first ice we had seen, apart from one or two small growlers. Then the wind failed and as we were anxious to reach shelter while the weather remained clear and calm, Millett reconnected the engines, and we motored for the last hundred miles, reaching Port Lockroy the following day.

Coming from the dark, heaving ocean into the quiet channels of north Graham Land was an amazing contrast, for one was suddenly transported from the dull, dreary expanse of a leaden-coloured sea into the full beauties of a polar land. The day we passed through De Gerlache Strait and Neumayer Channel on our way to Port Lockroy was clear and sunny with a cloudless sky, giving us a good opportunity to appre-

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ciate the grandeur of the scenery amongst which we should make our home for the next two years. These channels, though deep, are in places less than a mile wide, and are fringed with ice-cliffs some hundred feet high, with serrated edges following the shore-line and forming little bays and points. Behind the ice-cliffs the mountain ranges rise to snowy peaks 4000 or 5000 feet above the water. There is dark rock exposed on the mountain sides, but the most striking features are the hanging glaciers and ice-falls, showing every shade of blue and green as they are caught by the sun's rays, or else darkened by shadows. The sea itself was oily calm with that strange misty glow which seems peculiar to the cold water of the polar regions when there is no wind. On the surface small icebergs and smaller growlers, newly broken from the cliffs, lay sparkling in the sun like vast jewels set in the long winding channel. The only sounds that could be heard were the occasional roar of an avalanche, or a dull grumbling as an ice-cliff calved, and perhaps the cry of a Dominican gull going to or from its breeding-ground near by.

CHAPTER TWO

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AS we motored into Port Lockroy we eagerly scanned through field-glasses a group of low rocky islands lying in the harbour, on which we expected to find Hampton and Bingham camped. As we came closer we first made out a pyramid tent, and then piles of stores covered with tarpaulins. Soon after we dropped anchor, Hampton and Bingham, who had evidently been in their tent with the paraffin stove going and therefore could not have heard us arrive, looked out and were surprised to see the ship lying only about half a mile from them. They soon came off in the motor launch and gave us their news. They told us that on leaving Port Stanley the *Discovery II* ran into heavy seas which soon made havoc of the dog pen which had been put up in the fore-part of the ship, so that they were reduced to waging a constant war against breaches in the pen walls and straying animals. The rolling ship and the rushing water made it impossible for the dogs to keep their feet on the slippery deck, even though battens were fastened down fore and aft. The huskies were therefore constantly being found all over the ship in the most out-of-the-way places, and it was a common occurrence to receive a message to say that there was a dog in somebody's cabin and could he please be removed. Eventually the forward pen became untenable, and a small jury one was rigged beside the larger one on the after-deck, but as it was constructed of canvas, the only available material, its life was short, so the only solution was to chain the dogs from the forward pen along the alleyways between decks and in any other available spaces. The constant din they made was not conducive to sleep in the near-by cabins, and throughout this time the personnel of *Discovery II* could not have been more helpful or uncomplaining. However, on December 6th the ship ran into good

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weather and by evening entered the Schollaert Channel.

The dogs were to have been landed at Port Lockroy, but De Gerlache Strait was found to be blocked with ice, so the ship retreated to Deception Island after a night spent among the Melchior Islands. It was decided that Hampton and Bingham, with the dogs, would be left at the deserted whaling station there to await more favourable ice conditions further south.

After prospecting ashore, they found a small wooden house in good repair which they chose as their temporary quarters, and next morning, after landing the dogs and provisions, Captain Nelson took the *Discovery II* to sea to continue the survey of the South Shetlands, leaving Hampton and Bingham in the loneliness of the derelict whaling station.

The month which they spent at Deception Island was by no means a slack time, as the dogs needed constant attention. They had complete freedom, and at times were inclined to wander far from the station, and had to be retrieved with our motor boat, which had been left with Hampton and Bingham so that they could collect seals for future winter use. Altogether 60 fine seals were shot, cut up and hung in halves in a large shed near one of the two jetties. This was a slow business as many of the seals had to be brought long distances. With only two men, if there was a strong wind blowing only one could land on the beach, while the other lay off in the boat until a load was ready. Then the seals had to be pulled down to the water's edge and towed to the station. This was no small matter as their weight when alive is anything from a quarter to half a ton.

During this month the *Discovery II* visited the island once, when she came in to celebrate Christmas, but was off again early on Boxing Day morning. On the evening of January 9th she again arrived, this time to make another attempt at getting to Port Lockroy. First thing next morning the seal meat was taken on board, to be followed by the personnel, gear and dogs, and that evening in beautiful weather a start was made. Port Lockroy was reached without trouble, and the

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Discovery II stayed there until January 19th, unloading the dogs and stores—including the aeroplane, which had been put on floats before being landed. After the *Discovery II* had left, Hampton and Bingham were again alone with the dogs, this time in a tent on the foreshore of one of the small islands, while on a neighbouring island was a large dump of stores and the aeroplane tightly moored. They had not long to wait, however, for we appeared unexpectedly early two evenings later, and once more the expedition was united.

Now that we had arrived, the first thing to be done was to try to find a base site; for there was not enough time to repair our engine-beds and then get far south before the freeze-up. From having talked with Doctor Charcot—the leader of the only expedition which had wintered as far south as this on the Graham Land coast—and by reading his reports, it seemed that the channels north of his old base on Petermann Island, some 20 miles south of Port Lockroy, and also the channel between Petermann Island and the mainland, were likely to remain open for most of the winter. But if we could find a suitable place for our base at the entrance to Grandidier Channel, which is between the Biscoe Islands and the mainland, we should have a sledge route to the south when the winter ice formed, for the channel is wide but sheltered, and should not have a strong current to stop the ice forming like the narrower ones further to the north. To reach a base site at the entrance to this channel, the *Penola* would only have to motor in calm and comparatively ice-free waters, where the engines should work without going out of line. To try to take the ship in her present condition any further south down the unsurveyed coast which we knew to be infested with sunken reefs and rocky islands, and where the weather is notoriously bad, would be courting disaster. We therefore had to reconcile ourselves to a winter spent in north Graham Land, and adjust the expedition's plans accordingly. This of course was a great disappointment to everybody, but was caused by circumstances beyond our control.

When we arrived, Hampton already had the aeroplane partly rigged and this was finished in another two days. But once the machine was

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on floats, the problem arose where to keep it, for Port Lockroy was still half full of winter ice which was breaking up and being carried backwards and forwards by the tide in large pans big enough to crush the aeroplane. We eventually found a small glacier-filled valley where the cliffed ice edge, some 20 feet high, rested on a sloping pebble beach. It was an easy matter to blow a hole in the ice large enough to take the aeroplane, and then make a wooden slipway up which to wheel it after fitting the wheels specially designed to fasten on to the floats.

January 27th was the first fine day after Hampton had the aeroplane ready to fly. He made a short test flight, and then Ryder and I climbed into the cabin and took off to fly south. We followed the coast for 50 miles, but found no place on the mainland where even a temporary camp could be established, for the coast is fringed with a narrow belt of glaciers lying at the foot of the mountains, and these terminate along the shore in ice-cliffs 60 to 120 feet high. For mile after mile the wall of ice is unbroken except at some headland where the rocky cliffs of a mountain spur plunge straight down into the sea. However, we at last saw a group of small islands 30 miles south of Port Lockroy and 10 miles south of Charcot's old base on Petermann Island. Charcot had visited these islands and named them the Argentine Islands. They were 5 or 6 miles off the coast, and appeared to have several suitable harbours. We circled low over them two or three times, and then flew back to the ship, keeping a sharp lookout for submerged reefs, which, from the 2000 feet at which we were flying, showed up clearly.

As we were not going far south we would have plenty of time to establish our base, and being as yet unused to recognizing features in this new country from the air, we decided to have a better look at the islands and sound out the approaches to them, which we had seen to be studded with rocks. Accordingly, Riley, Ryder and I left at 5 o'clock the next morning in the expedition's motor launch. This motor launch was a good, sturdy little boat, and a veteran of polar work, for we had used her in East Greenland for two summers on Watkins's last expedition. The day was perfect for boating, with bright sunshine and no

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wind. After crossing Flanders Bay and passing through the impressive Lemaire Channel with its steep cliffs rising sheer from the water to a height of 2000 feet, we arrived at the Argentine Islands in time for lunch. The only ice we had encountered was in the form of growlers, and in Lemaire Channel a small amount of brash which had been packed together by the current, but the pieces were very small and we had no trouble in passing through.

When we arrived at the Argentine Islands we found them a most delightful place. The main creek and anchorage was enclosed by three large islands, each about $\frac{1}{2}$ a mile square and 150 feet high. They were mostly covered in ice, except on the north sides where we found exposed rocks with large patches of moss on them and little waterfalls trickling down into the quiet channels—a scene we had not expected to find in the Antarctic. As we motored among the outlying islands the abundance of bird life was surprising. Great flocks of shags flew round us, and Dominican gulls and terns gave us a casual glance as they passed on their way, while skuas watched from the rocks.

When we entered the creek which, from the air, had looked to be a good anchorage, we found it still partly blocked by winter ice, but there was enough open water to sound it adequately. It proved to be up to our best expectations, with plenty of water for the *Penola*, while a few hundred yards away was a flat, stony beach which would make an excellent place to build the base house.

After we had satisfied ourselves that the *Penola* could approach and enter the harbour safely we started back the 30 miles to Port Lockroy, which we reached late in the evening well pleased with the day's work.

The *Penola* would only take one day to go from Port Lockroy to the Argentine Islands, so, instead of restowing the cargo to make room for all the *Discovery II* had left for us, which would mean filling the cabins and any other space that we could find, we decided to make two trips, starting at once with the first load, and leaving Hampton and Bingham behind once more to look after the dogs and aeroplane.

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We left on January 29th, and after an uneventful trip arrived at the Argentine Islands in the evening. Uneventful as the trip was, it nevertheless had its anxious moments, for we were now in uncharted waters, where the ordinary methods of navigation could not be used; in fact, it all had to be done by eye, and by trusting a good deal to luck. We were fitted with an echo-sounding apparatus, but this was of little use in warning us of approaching dangers, for the reefs and rocks rise so steeply out of deep water that the sounder could give no indication of them until too late. However, the method which we adopted throughout the expedition of first making a flight over the route which the ship was going to take, and then using the motor boat for sounding the harbours and approaches, proved most satisfactory.

The narrow channels in the Argentine Islands were still blocked to some extent with winter ice, and the *Penola* was not able to reach the best position for unloading. However, after she had butted her way in as far as possible, we blew up the ice along a tide-crack, thus opening a narrow lane of water to the selected base site large enough to operate the small boats in. The weather remained calm, and we were ready to fetch the second and last load from Port Lockroy on February 5th. This load would be so large that there would be no room for the aeroplane on deck, so we proposed to take it to the Argentine Islands under its own power. We fully intended to use the aeroplane as an independent and self-supporting unit, but at this stage of the expedition we had had so little experience of the country and general conditions that we decided it would be wise to send the *Stella* ahead so that she could be in attendance on the aeroplane when it arrived. We had the ship practically loaded on February 7th, so Riley and Roberts left for the Argentine Islands in the *Stella* early the next morning, to which Hampton and I were to follow them with the aeroplane in the evening. In the afternoon, however, the weather became bad and we were not able to get away until the afternoon of February 9th. Even then, when we reached the Argentine Islands we saw that all the channels were choked with small pieces of ice, forcing us to come down outside. There

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was obviously a moderate swell running, for we could see white foam round the outlying rocks. We circled round until the *Stella* was clear of the islands and in a position to help us; then Hampton brought the plane down, landing safely. The *Stella* immediately took us in tow and we soon had the Gipsy Moth moored in a sheltered cove. Riley and Roberts had already put up their tent by the provision piles, and we now pitched ours beside it and made ourselves comfortable.

We spent the next day roaming over the islands and getting acquainted with what we expected would be our home for the next year. We were all very pleased to be on solid land once again after the cramped and unnatural life on board a small sailing ship.

The *Penola* was expected on the evening of the next day, but she did not arrive, and, in fact, three days went by without any sign of her. We were not particularly worried, for we could see heavy storm-clouds to the north although the weather with us was calm and sunny, and we spent our time laying the foundations for the house. On the fourth day, Hampton and I took off in the early afternoon with the intention of flying north to see how the *Penola* was faring. When we reached Lemaire Channel we passed under a dense cloud layer which was covering the mountains down to about 3000 feet. Then as we emerged from the north end of the channel we were struck by a strong wind sweeping off the mainland, and far below us we could see the water being lashed into white-topped waves. We flew on to Port Lockroy and saw the ship still lying at anchor there. The wind was too strong and the sea too rough for us to think of landing, so after circling round her several times and ascertaining that she was in no difficulties but just waiting for the weather to moderate, we flew back the 30 miles to the Argentine Islands, where we landed in bright sunshine on a glassy, calm sea. The wind to the north eventually died down and the *Penola* arrived on February 14th. Ryder had attempted to leave Port Lockroy during a lull in the weather on the 11th, but he had only gone a few miles when he was forced to shelter in a harbour which we had seen from the air only about 5 miles from Port Lockroy.

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By the time the *Penola* reached the Argentine Islands the ice had all gone out of the creek, and she was able to move into her permanent winter quarters. As soon as the unloading was finished the ship's party settled down to their work of preparing her for the winter, and repairing the engine-beds in preparation for the next summer's cruise. In the meanwhile the shore party started building the house, a job which took three weeks. When the house was well under way, Stephenson began erecting the meteorological screen and observation house on top of the island, and the other scientists began work in their various departments, while Hampton and I prepared for a reconnoitring flight to the south so that we could get some data on which to base our plans for the forthcoming sledging season.

February 28th was a clear sunny day, and Hampton and I left the aeroplane moorings about 11 a.m. We planned to fly 150 miles down the coast to see if we could find any practical inland sledging route to the south or east. Hampton taxied the Gipsy Moth out to our usual taking-off ground, which was a sheltered expanse of water north of Winter Island (the name we had given to the island on which the house was built). On this particular morning we found the sea clear of the small pieces of brash ice which are one of the polar aviator's worst troubles, while a gentle breeze rippling the surface broke up the skin friction and enabled us to take off without difficulty in spite of a heavy load of petrol and emergency forced landing equipment.

Once in the air we headed towards the coast, and when about a mile from the headlands turned south, flying at an altitude of 3000 feet. As we flew on, the country afforded us a magnificent view of awe-inspiring scenery, but our hopes of finding any sledging routes soon faded away. For even the promontories were fringed with narrow glaciers ending in ice-cliffs. Further into the bays these narrow glaciers gave place to broad crevassed ones or to rocky cliffs where the mountains came to the water's edge. The backs of the bays terminated in steep valley glaciers which flowed down from a large glacier running parallel to and at the foot of the great plateau scarp. This large glacier was fed by tremendous

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ice-falls which, in places, poured over the 4000-foot sheer rock wall of the central Graham Land plateau. One or two of these ice-falls looked as if they could be climbed, but only by a small party travelling as light as possible.

As far as Pendleton Strait we were able to follow Charcot's map, but south of this point the country appeared very different, and as far as the map was concerned we were lost. As we flew on we saw heavy banks of clouds ahead lying along the coast and filling the bays. They appeared to extend to within a few hundred feet of the water, so we immediately started gaining altitude in the hope of climbing above them, and soon found ourselves flying at 7000 feet and about 800 feet above the cloud layer, which became denser until it blotted out all the country below and we had to content ourselves with looking at the high plateau and the magnificent mountain-tops. We had now entered the complicated fjord system just north of Adelaide Island, and, confused by the dense cloud beneath and the obvious errors in the existing map, we could not identify any of the country other than the island. We had flown 150 miles from the Base and there was nothing to be gained by going on, so we decided to turn for home. At our turning-point a few gaps appeared in the clouds and we could see that we were approaching the head of a large broad fjord, the back of which was full of unbroken winter ice. Far to the south, on the other side of the great promontory which juts out towards Adelaide Island, we could distinctly see open water in Marguerite Bay.

After we had covered some 50 miles of the homeward flight we were relieved to find the clouds diminishing, and in a few minutes more they had all gone, enabling us to look down on the sea and the great icebergs which, from the aeroplane, appeared like tiny sheets of white paper floating in the blue water.

The results of this flight made it obvious that we could not hope to get enough supplies up on to the high central plateau to make long journeys to the south or east possible, and it was clear that our exploration work would be confined to the west side of Graham Land until we

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could take the ship further south the next summer. We formulated tentative plans to be carried out as soon as the ice in the straits between the Biscoe Islands and the mainland was bearing. A sledge party, we decided, would then try to reach the north end of Adelaide Island some 140 miles from the Base, and there establish a landing-ground for the aeroplane. The party would have to travel over sea-ice close to the mainland, but should be able to camp each night in the back of a bay or on one of the numerous small islands along the coast, thus avoiding any danger of a sudden break-up of the ice off the headlands, which we thought might be a common occurrence throughout the winter. Once the landing-ground was established, Hampton would fly 2000 pounds of sledging provisions down to it, which would involve about five flights. After the second one, the sledging party which had established the landing-ground would carry the stores on another 70 miles to Jenny Island, which lies at the south end of Adelaide Island. While this was going on, another party would leave the Base, and after connecting with the advance one, would push on to try to explore the unknown area south of Marguerite Bay. This journey should be completed before the ice broke up along the coast, and then, as the ship's engine-beds would by this time have been repaired, the whole party could move further down the coast as soon as the ice was open enough, and establish a new base as far south as possible. If the ice broke up while the sledging parties were away, thereby cutting them off from the Base, they would be prepared to wait at Jenny Island until the ship or aeroplane could connect with them in the summer. Moreover, several depôts could be laid along the coast as further safety precautions.

In the meantime we should have to confine ourselves to intensive work on and around the small group of islands which were now our home. Apart from the scientific work, which involved many short aeroplane flights and motor-boat trips within a radius of 20 miles—a limit set by the complete lack of small-boat harbours within a reasonable distance south of the Argentine Islands—our time was spent mainly in leaving a large depôt of sledging provisions on the Berthelot Islands

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(a group of small islands close to the mainland opposite the Base), collecting seals for the winter and looking after our dogs.

We had no trouble in collecting all the seals that we could possibly want, for they were to be found lying about on ice-floes either singly or in groups, sometimes numbering up to ten or fifteen. The seals in this part of the Antarctic are crabeaters and Weddells. After sampling their meat we found that the crabeater was vastly superior in flavour and eating qualities, and any Weddells that we killed during this first year were kept for the dogs. The other sources of meat supply were sea-leopards, penguins, shags and various other sea-birds. The meat of the sea-leopard was most unpleasant—in fact, even the dogs refused to eat it. The birds we scarcely used, as killing and preparing them for the table involved too much trouble for the small quantity of meat gained, and in any case, before the new ice forming in the channels forced us to pull the boats out of the water for the winter, we had ninety crabeaters stored away in a cave dug in the ice on the side of the hill behind the house.

By the end of May the ice in the channels was strong enough to let us pass over it from one island to another, and we immediately started driving our various dog teams. There was a certain amount of confusion at first among the dogs, for we of course had no idea which were the leaders, though Bingham had long ago been able to discover which were the dogs belonging to the various teams, and also the ones that had been bought singly or in pairs. He had pretty well decided this by watching them on the voyage from England, but when they were let loose on land all doubts were soon gone, for huskies when left to themselves split up into teams or family groups for protection, each group of dogs taking up a certain position round the house, and pouncing on any intruder that may come too near. Bingham spent a strenuous time during this first year looking after his charges, and here is his own description of his work with them:

“It seems impossible to describe a husky satisfactorily; hardy,

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staunch, hard-working, at times playful, at times brutal, always appealing, though sometimes aggravatingly moody, their stamina and pluck is something to marvel at.

"As quite a number of our dogs were old, and owing to the losses among the Greenland animals there were insufficient for our needs, it was necessary to increase their numbers by careful breeding. Attention had been paid to this side of the question, and one family had already arrived before the expedition reached Port Lockroy and several more were expected. Immediately the house was built, and the stores all in their winter quarters, preparations were started for their reception. Large solid-sided crates were constructed with a narrow entrance door, and on to these were built wood and wire enclosures, out of which the mother could jump, but not the pups. In this way they had a safe retreat and room to exercise, without getting so scattered that the mother could not protect them from bullying or cross-tempered elders. It was not long before six or seven families were installed in these quarters, giving the surroundings of the house the appearance of a chicken farm. In fact, during the winter and spring spent at the Argentine Islands eight families were born, comprising 45 pups, and these youngsters were the backbone of our teams during the long sledge journeys the following year. The pups were weaned on Nestlé's milk, and were then fed four times a day with small amounts of mash made from corn meal and minced seal meat. Later the number of meals was cut down to three, then two, and finally one a day. All meals were served warm in small wooden troughs to ensure cleanliness, and plenty of water was given to the pups. This treatment produced magnificent animals which were to prove of great use the following year. All the wood-wool and straw from the packing-cases was carefully collected and stored for use as bedding, and this supply lasted almost to the end of the expedition. A garden rake proved very useful for cleaning out the dirty and frozen straw from the crates twice a week. The pups always remained outside, and it never proved necessary to have them indoors even in the

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worst weather unless sickness made closer observation essential. On the whole there was very little of this among the dogs; a few abscesses were treated successfully, and a few cases of bad wounds were the main items suffered during that winter.

"To give an example of the vitality of these animals: one morning on going round the pens I discovered a wretched pup only two or three days old which had been ousted by the others. It was behind the mother, who was unconcernedly lying on it. When I lifted it up, it was almost stiff, had a decidedly flattened appearance, was apparently not breathing and stone-cold. After some minutes' warming over the stove in the house and mouth-to-mouth artificial respiration it produced a squeak. Later it returned to a more rounded shape, and finally took a few drops of milk from a fountain-pen filler. After two days' care in the house, having fed from a bottle and spent the night in bed with its foster-father, it was returned to its mother and thrived so successfully that it eventually completed the southern journey in 1936, being a very useful member of its team.

"Despite the fact that there was abundant food for the dogs, we were greatly troubled by straying. This was mainly due to the large percentage of youngsters. Normally these strays would have returned to the Base after their hunt, but unfortunately the ice conditions round the Argentine Islands were exceedingly poor. One never knew when large masses of ice would break up and disappear out to sea. There were also many treacherous places where currents kept the ice from forming, and these places were frequently covered by a layer of slush, so that a dog getting into one would never get out. Moreover, those seals which stayed with us all the winter could get out on to the ice almost anywhere, thus forming a great temptation for the dogs. In this way our losses were distressingly large, so we tethered as many of the dogs as we could; and our experience showed that if these conditions were at all likely to recur, the safest method would be to bring out enough chains and swivels to tether every animal. Each dog driver could then attend to his own team and see

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that their chains were kept clear and the snow round each dog clean, but the feeding and general supervision is better done by one man. If dogs are to be chained like this, strong chains and swivels are essential, for it is unbelievable what they can break, especially when the metal becomes brittle in the intense cold. Even with swivels, which are inclined to get jammed by ice, the chains need constant attention, as a dog sometimes keeps circling in one direction until his chain becomes a solid bar, and then it only requires a few extra turns to strangle him. Two of our dogs were lost in this way, although there was careful supervision all the time. Our routine was to visit all tethered dogs last thing before retiring for the night, to see that all chains were quite clear, the round being repeated again first thing in the morning. During the day, anyone seeing a chain getting tangled immediately cleared it.

“In the summer, of course, if the dogs were on rock or shingle they had to be watered, and this was troublesome, for we found that huskies seemed to take the greatest delight in deliberately picking up the tins of water in their teeth and upsetting them even though they were weighed down with stones. Some dogs were quite incurable; one bitch in particular made an invariable habit of carrying water tins round the island and visiting chained dogs as though she wished to give them a drink. The tins were large biscuit tins with stones in the bottom, but even when these were full of water she would carry them long distances. At one time when she had a family she often carried a tin of water into her crate and spilt the entire contents over the pups, much to their disgust and her apparent surprise.

“Two months after our arrival at the Argentine Islands puppies were very much in evidence, growing almost visibly and needing much attention. One of the most important points in breeding huskies is to give them the right amount of human contact when young. This is not a difficult matter as the average husky mother is very tolerant of human interference with her family. I made it a practice to handle the pups a few times before their eyes were open,

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so that later when they could see they were less terrified. As a family grows up there are usually one or two which are much shyer than the others, and one must watch for these and continue to handle them every day until they lose their nervousness. If this is not done they easily develop into 'biters,' a vice which is brought on through sheer fear and nervousness. This can later be cured in most cases, but only after much trouble, and some never lose the bad habit. A 'biter' or highly nervous dog is always a nuisance in a team as, unless constantly tethered, he is very loath to allow himself to be caught, nor is there the same pleasure in driving unfriendly dogs.

"It was not long before our puppies reached the age when the sterner things of life had to be faced. Their training in harness started when they were about 6 months old, and this was found a very satisfactory age at which to begin. In Labrador puppies often face long runs when younger than this. The owner will take them out in a box on his sledge, and when he turns for home tumble them out in the snow so that they must run back behind the team, the idea being to harden them while young. We, however, went on the theory of building up big, strong animals first and training them afterwards. The feeding and care given in the early stages makes an immense difference to their careers, and we found that dogs transferred to a meat diet directly after weaning were not as big or strong as those which were reared on corn meal and minced meat. This is the practice followed by the best European drivers in Labrador, and probably other parts of the Arctic unknown to me. The Eskimos are more careless about rearing, and as a result possess poorer animals.

"Our method of training was to harness a small, steady team, including the mother of the puppy which was going to be trained, drive this team out on to the level sea-ice, and then, having harnessed the pup, lead him out to the team and put him on a trace the same length as his mother's. Getting the puppy on to the ice presented some difficulties. One usually had to drag him along, resisting stubbornly

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until the tide-crack was reached, when he would suddenly decide to bound across at top speed, usually choosing a course quite different to that chosen by the man leading him. Then he might either see the team and make madly towards it, or decide to return to the house and immediately plunge back across the tide-crack. However, patience always won the day, and at last the whole outfit would be ready to start. We had two men on these occasions, one to manage the sledge and brake, the other to concentrate all his efforts on the team. As soon as the sledge started, anything might be expected from the pup. Some started immediately beside the mother, never giving the slightest trouble, others lay on the snow completely bewildered. In this case the brake was applied to slow down the team, while the driver flicked the pup's hind-quarters with his whip sufficiently hard to sting him without really hurting. Sometimes this had the desired effect, but if he persisted in lying still or, as often happened, running back to the sledge and trying to crawl under or on to it, the sledge had to be stopped and the pup led out to the full extent of his trace beside his mother, and another start made. Sometimes this would have to be done again and again. Some youngsters would go well for about five minutes, and then suddenly decide that they were tired, or that this was a silly game, and without any warning run out to the side or lie down. This was an occasion when one needed to be expert with a whip. The driver had to be alert and ready to anticipate the puppy's movements. Soon the pup realized that all was well as long as he ran quietly with his mother, but if not, all was very far from well. Usually we started with a round course of about 3 miles, then next day, if the pup had gone nicely, we would give him a short spin, and then returning to near the Base add a brother or sister, and off again for our 3-mile run, and so on. In this way we trained and drove 40 of our own breeding.

"Usually we were adding pups to our older teams in varying proportions, but in one instance we had a family consisting of one dog and six bitches, and we decided to turn them into a team, with the

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dog as a leader. This meant much more strenuous work for the trainer because as soon as all the pups had been broken to harness we had to take them out alone with an untrained leader. This was done by making a track in the snow with another team, and then driving the pup team round on it. Then a branch trail was made and the new leader was taught to answer the word of command as to which fork to take, and finally they were driven over virgin snow. The training of this team gave much amusement to many of the members of the expedition, who could watch from afar the exasperated driver striving to persuade the team that they were all expected to go in one direction, and not to radiate like a star or take him back to the Base via the petrol dump, ration boxes or other obstacles. Sometimes the leader would get stage-fright, turn round, run in among his sisters and lie down. Immediately the whole team would huddle together and crouch down in a tight ball, each one trying to get deeper into the clump and so avoid the baleful eye of the driver. As they were all on separate traces, the resulting tangle can easily be imagined. Later two lone sister pups were added to this team, which was known as the 'bitch team,' or 'girls,' and eventually became one of our fastest and best.

"Much thought had been given to the equipment of the dogs, the efficiency of which makes for so much pleasure or otherwise on any sledge journey. We went south supplied with rope, webbing and lamp-wick for harness-making. The latter was an original idea of Rymill's. It consisted of strong, flattened tubular wick $1\frac{1}{2}$ inches broad. Rope harnesses were used for local work round the Base merely to save expense, but two lamp-wick harnesses were made and specially fitted for each dog. These were used for the longer journeys and proved excellent. We at first felt some anxiety as to how this material would stand up to hard work, but this was quite unfounded, as they never gave the slightest trouble, and the soft material was very easy on the dogs. The only disadvantage was that in summer-time it soaked up moisture, but this did not worry the dogs at all.

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The webbing also was excellent in the summer, but in winter, when the harness froze hard, it was very liable to break.

“At first the harnesses were of construction similar to the Labrador Eskimo type, but later this was improved upon by crossing the two main loops. The cross took the place of the usual transverse chest strap, the strap above the neck remaining as before. This left the head hole as a V shape and so kept the harness under the legs further from the armpits. Using this design in lamp-wick, the dogs were completely free from chafing. To the back end of the harness was attached a short cod-line trace with a ring at the end. This means that the bulk caused by attaching the trace to the harness hangs clear of the dog's stern and so cannot chafe. A very convenient method of attaching the trace to the ring on the harness is to have a strong clip hook on the end of the trace, then if the dogs are given a permanent cod-line collar, it is a short job at night while on a journey to unclip the trace from the ring, remove the harness, and clip the trace to the collar. This entails added comfort for the dogs and no fear of their eating their harnesses. As the harnesses had been fitted individually to ensure comfort, it was important to be able to recognize them. This was managed by having a large selection of coloured braid, and coloured tabs were sewn on each harness so that the driver had only to memorize which colour belonged to each dog. Bells were also used, not only because they make a pleasant sound during a monotonous trip, but also because they seem to cheer up the dogs and improve their pace. On a long journey it is a good idea not to use the bells at first, but when the dogs show signs of loss of keenness to produce them and fasten one to their harness.

“The whips used were 22 feet long, constructed on the principle of the Australian stock whip, and proved excellent, being much easier for the beginners to use than the usual dog whip. Their only disadvantages were that, being plaited, they were inclined to wear more quickly than the Eskimo whip, which is made of thick skin, and they were also rather short for our method of dog driving. We had one

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sample of the Labrador whip which proved best of all in the hands of an expert. It has a very short wooden handle running directly into the heavy butt end of the tapered whip. The lash is made of walrus-hide strips laid side by side and stitched together with seal-skin line. Its length is about 35 feet, but it is so well balanced that it can be used with accuracy, thus giving one much better control over a team on long traces.

"We found the best trace rope to be $1\frac{1}{4}$ -inch tarred hemp. The dogs do not like eating the tarred rope, and the hemp soon developed a smooth polished surface which made disentangling easy, as the traces could be pulled through singly from behind the tangle. Manilla, on the other hand, always remains rough and is difficult to disentangle, swelling and becoming quite bulky with use. We also tried log line, which, with its smooth surface, is excellent for disentangling. In cold weather, however, it becomes like stiff wire and quite unmanageable, and when it breaks, too, it is difficult to mend without a bulky knot, while ordinary rope can be repaired in a few moments with a simple short splice.

"Although the first year was somewhat scanty in results, the short journeys which we were able to do gave us opportunity to try out all equipment and decide moot points, so that when our chance came during the second year, every detail was in perfect order, and on the long journeys which we were then able to make all the dogs proved most satisfactory. It was interesting to watch the relative merits of the Greenland and Labrador animals. The impression that one got was that there was nothing to choose between them so far as hauling heavy loads on slow surfaces is concerned, but that the Labrador dogs are on the whole of a more long-legged rangy type and faster than the Greenlanders on good surfaces.

"So many of the best animals we had were of our own breeding that during the last two main journeys from the southern base 50 per cent. of the dogs used were bred and trained on the expedition. An analysis of the teams showed that of the animals to return, 56 per cent.

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were born in the Antarctic, proving how well the youngsters were able to stand up to the rigours of a long journey, compared with the older dogs.

“Their health was excellent throughout the two journeys, though their diet consisted of only one pound of Bovril dog pemmican daily. Stephenson on his journey took the blubber from one seal and supplemented the pemmican diet with an occasional small piece of it, while on the eastern journey any animals which had to be destroyed were fed to the others as fresh meat. Occasionally an Adexolin capsule was given to each dog as an experiment, but their general health was so good that it is uncertain if this had any effect or not.”

The ice in the channel between the Argentine Islands and the mainland showed signs of bearing early in July, but whenever it was nearly ready to let us start sledging, a storm, generally accompanied by a rise in temperature, would break it up again. However, at last, on July 25th, we were able to venture out on it. We did not get far, for rotten ice and open water along the coast prevented us from reaching our depôt on the Berthelot Islands. Although the ice in the main channel was bad, that in the smaller and more sheltered ones among the Argentine Islands had been bearing for some time, and on August 4th we were able to make our first flight off skis from the sea-ice in a sheltered lagoon to the west of Winter Island. The flight was a reconnoitring one for some 50 miles down the coast, since, as the main body of winter ice had just withstood a gale, we thought that at last we should be able to start sledging south. What we saw was encouraging; although there was thin and rotten ice over most of the channel behind the Biscoe Islands, that along the coast, once Beascochea Bay was reached, appeared to be bearing well, and snow-drifts round the pressure ridges indicated that it had not broken up for some time.

We were now keen to start, but bad weather held us up again until August 18th. On that day a formidable array of sledges left the Base. Bingham, Martin and Moore with two teams made up the advance

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party, which hoped to establish the landing-ground at the north-east end of Adelaide Island; Ryder and I with one team were to travel with them for the first 50 miles to establish a depôt to be used by the returning sledge parties, and we were also to mark out with flags an emergency landing-ground for the aeroplane. Stephenson, Fleming, Bertram and Millett were coming with us as far as Beascochea Bay, where Stephenson would carry out a survey and the others do what geology and glaciology they could.

We were going into virtually unexplored country, for although the mountainous coast had been seen many times from ships some 30 or 40 miles out to sea, no one had, to the best of my knowledge, ever landed anywhere on the mainland south of a point opposite the Argentine Islands.

We left the Base about midday, intending to go only the 8 miles to our depôt on the Berthelot Islands. When the outer islands of the Berthelot group were reached we found the ice terribly thin and undercut by strong currents. So thin was it that it looked a dark grey colour with quite large patches of water here and there. When travelling across thin ice we adopted the usual method employed by the East Greenland Eskimos, that is, prospecting ahead of the sledges with an ice-chisel. Our ice-chisels were made of ash shafts about 6 feet long, much like the handle of a rake, on the end of which was fastened a strong steel chisel with a blade $1\frac{1}{2}$ inches broad. When walking over dangerous places the ice should be tested at every step by striking it with the chisel. A man on skis and a dog team pulling a fully loaded broad runner sledge can often pass over ice which the chisel will go right through with one hard blow, but no rules can be laid down for the thickness of ice which can be walked on, for so much depends on the temperature at the time, the rapidity with which it is formed, whether it is being undercut by a strong current or melted from the sun's rays above, and many other considerations. However, a man with several winters' experience behind him should be able to tell just how far he can go in safety. After finding and marking a devious route to our depôt, we got all the

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sledges there without any mishaps, though several of the dogs fell through the ice in the thinnest places.

Midday the next day saw us well across the mouth of Beascochea Bay, where Stephenson, Fleming, Bertram and Millett left us to travel down into the bay and there establish a camp from which to do their work. The weather remained perfect, and by the next evening we were 25 miles from the Base and approaching a narrow channel which we had seen from the air between Chavez Island and the mainland. Here we expected thin ice, and Bingham and I went ahead with our ice-chisels. For a long time we thought we should not be able to get through. Everywhere we tried the ice became too thin, while in the centre of the channel we could see a large expanse of open water. Besides the strong current the ice was evidently being broken up by ice-blocks falling from the high glacier cliff bordering the mainland side of the channel. Even so, we at last made out a precarious route by keeping close to the opposite shore, which was formed by the steep rocky side of the island. When we brought the sledges across the thin ice it quivered and bent under their weight, but once through the narrows it became solid again. By camping time the next day we had reached the position 50 miles from the Base where we had decided to lay the depôt and where Hampton wished the emergency landing-ground marked out. Here we made a change in the personnel, for although the temperature had not been more than 50° of frost, Moore, owing to a poor circulation, had got both his feet frostbitten. The frostbite was only superficial, but as large blisters had formed on the soles of both feet, walking was very painful. Apart from this trouble, Bingham decided that he could travel more efficiently under the present winter conditions with only two men in a tent instead of three. Therefore, as Moore should have been navigating the advance party, Ryder took his place and Martin and Moore prepared to return with me to the Base.

In the morning—August 22nd—we three said good-bye to Bingham and Ryder and then started for home while they went on their way south. We were now three men with one sledge, but the surface was

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good except off the headlands, where newly formed and therefore salty ice uncovered by snow caused a great deal of friction. Moore was able to ride all the way, while Martin and I took it in turns to run behind my team of 10 dogs. We made a good day's travel of 23 miles, negotiating the narrow channel between Chavez Island and the mainland safely before nightfall, and by the next evening we had connected with Stephenson's party in Beascochea Bay. They had just completed their work and were ready to return with us to the Base, where we arrived on the evening of August 24th.

I had promised Bingham that Hampton and I would fly south and connect with him on the first possible day after we reached the Base, but foggy weather held us up until August 27th. That was a fine clear day with no wind, and we got away about 11 o'clock. We soon covered the 50 miles to the depôt and landing-ground which I pointed out to Hampton, and there we picked up Bingham's sledge tracks, which showed up like a white ribbon lying across the darker shade of undisturbed snow. We followed the track for about 25 miles until we lost it among the islands bordering the north side of Pendleton Strait. We saw rotten ice and great pools of water between the islands, and as we flew on over Pendleton Strait itself we were surprised to see that it was completely open. After studying the situation it became obvious that the only place where the sledges might have found a way to the south would be close up against the coast, for the open water, bordered by a margin of thin and broken ice, extended right out to sea. We turned towards the great headland called Cape Evensen, round which we thought Bingham might have found a way, but on approaching we saw that open water extended right up to the cliffed shore line. The ice was too dark and wet for sledge tracks to show up on it, so we turned north, hoping to pick them up once more when we reached the more solid ice with its covering of white snow. After flying a few miles we saw where a camp had been made in a shallow bay near the beginning of the bad ice, and here we picked up sledge tracks which we followed north for about 8 miles, when we sighted Bingham's and Ryder's tent pitched on

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a small island. We circled over their camp looking for a place to land, then saw that Bingham had laid out a line of flags which was a signal telling us that it was safe to come down, and also showing us the wind direction and force. As we came lower the ice looked terribly thin with small patches of open water round the bergs and along the tide-cracks bordering the islands. But Bingham is an experienced and skilled ice-craftsman and we knew that we could rely on his judgment. So after flying low over the flags several times to study the position of the various icebergs and worst-looking patches of ice, Hampton throttled back and made a perfect landing. Bingham and Ryder came to greet us, and after testing the ice, which could be pierced with four good blows with the chisel, we retired to their tent for a cup of cocoa and to discuss the future. First, Bingham told us how they had fared since we left them on August 22nd, and I now quote directly from his diary:

“August 22nd.—After yesterday’s conference, and decision that Ryder and I should go ahead together, there was nothing to be done this morning but split the party and continue our separate ways. By 9.30 a.m. we had said good-bye to Rymill, Martin and Moore, and were off to a flying start. The surface was good and the dogs in such fine condition that they started as from a gun, thereby causing what must have been an amusing scene to any onlookers. In trying simultaneously to wave farewell and vault on to the top of my high load I misjudged the effort required, with the result that I took a header clean over the top, landing on my nose in the snow on the opposite side of the sledge. However, after this trivial mishap we made an excellent day’s travel. It did not take us long to round the cape ahead of us and start across a vast unnamed bay. All the way across the bay, and especially while passing a small group of islands, we found poor ice, but pushed on, hoping to find better conditions round the next headland. After doing 23 miles we finally made camp in a shallow nook just north of Cape Evensen, which towered above our tent. All night we could hear the almost continuous roar of vast

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avalanches cascading down the precipitous sides of the cape, but the ice in this backwater was sounder and we felt more secure than out in the open bay where, in many places, it was an easy matter to drive an ice-chisel through with one blow.

“August 23rd.—Yesterday’s mileage had made us quite hopeful of a fast trip to the north-east end of Adelaide Island, but today we were sadly disillusioned. Starting early, we headed south-west, hoping to round what appeared to be the next cape to the southward. As we drew level with it we saw that it was really an island. The ice was becoming thinner and thinner, until the dogs’ feet were breaking through, and by standing on our loads we could see open water ahead. Retracing our steps, we again tried between the mainland and the island and found better ice, but not for long. Reaching the channel we found in it open water from shore to shore, with an abundance of birds enjoying the sunny morning. These were penguins, Dominican gulls, Antarctic and snow petrels, and shags. There was no possibility of getting past as both shores were precipitous; so back we turned again and camped in much the same place as the night before, but now with the realization that although the ice in our own shallow retreat was fairly sound, there was open water to the south, bad ice to the north and no possibility of getting on to the mainland, the shores of which consisted of precipitous ice or rock cliffs. We felt thankful that the weather was calm, but the barometer was falling and the temperature rising.

“August 24th.—After prospecting on foot, we returned to the sledges convinced that our only chance of passing the open water was to head out to sea in the hope of rounding the outermost string of islands which run out from Cape Evensen and form the north side of Pendleton Strait. This we tried but found it impossible to get past them owing to very poor ice, but we were able to land on the north-west tip of the outermost one of the group where it ran out into a low promontory. Here we made camp on a very limited site, and then climbed to the top of the island’s snowy dome, and from there had a

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magnificent view of the north end of Adelaide Island with our objective plainly in view—so near and yet so far. The ice separating us from our goal was grey in colour, with numerous patches of open water. Ryder was able to get a good round of theodolite angles from this vantage spot, but another island blocked our view of what happened close to the southern side of the island which we were on, so we decided to prospect on foot in the hope that once round the islands we might find better ice and a road to the south near the shore. We found the ice so poor that it was necessary to go roped and on skis, but it was quite hopeless. Evidently all the ice in Pendleton Strait had recently gone out to sea, for all that we saw was young and not yet snow-covered. That night we spent on our island tongue and decided to turn back to the islands in the bay north of Cape Evensen and there await the aeroplane for instructions, for Rymill had said he would fly down the first good day after he reached the Base.

“August 25th.—Once off our precipitous camp site and away from the new ice we made good time back to the islands north of Cape Evensen which we named Fish Islands, and there camped after laying out a row of flags alongside which the aeroplane could land when it arrived. It was with some misgiving that I finally laid out the flags, thereby signalling to the aeroplane that the ice was safe for landing, but decided to trust to Hampton’s skill and care not to land too heavily.

“August 26th.—A foggy morning turned into a glorious afternoon, and about one o’clock we heard and saw the aeroplane droning past to the south. Later, on her return, we discovered she was following our sledge tracks and continued onwards to have a look over Pendleton Strait. We were relieved to hear Rymill confirm later that it was impossible to get any further south by sledge.”

Bingham went on to tell us that while they had been in their present camp the ice had been steadily deteriorating in spite of zero temperatures. This was evidently caused by a strong current coming into the

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Pendleton Strait. The season was too advanced to give us any hope of improvement in the condition of the ice, and as the thin and rotten stuff bordering the open water made it impossible to use a sledge boat, we had to abandon any idea of getting south of Cape Evensen.

We decided that Bingham and Ryder should work slowly northwards carrying out an accurate survey of the coast and off-lying islands, while Stephenson, Fleming and I would set out from the Base and carry a survey south to connect with theirs. This meant that we should map some 70 miles of previously unvisited country, but before the work could begin we would have to fly a wireless set for receiving time signals down to Bingham's party. This was done a few days later and, on September 1st, Stephenson, Fleming and I left the Base to begin our end of the survey, while Bertram and Roberts left at the same time to do some sounding in Beascochea Bay.

We worked slowly south, being much handicapped by rotten and young ice which made travelling difficult but interesting. Stephenson determined astronomical positions at frequent intervals, and from these positions took both vertical and horizontal angles with the theodolite. Between these theodolite stations the detail was filled in by plane table. By this means we were able to determine the main outline of the coast and fix the position and height of the prominent mountains lying between the plateau edge and the points of the promontories. In addition we were able to fix the summits of a number of islands out to sea, their actual shore-line being difficult to determine in winter-time. Such points as we were able to fix served, however, as very useful controls for further work in the summer when two flights were made over the islands and their general distribution sketched in from the air. Then, when the *Penola* motored down the channel between the Biscoe Islands and the mainland, soundings were taken and as much detail of the islands filled in as time permitted.

Our map in respect of this area covers a very broken-up part of the coast, with great bays cutting into the mainland and a multitude of off-lying islands, and we do not claim that it is entirely accurate.

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The mainland and islands lying close to the mainland, or to the *Penola's* route, can be considered as accurate on the present scale (1/3,500,000), and for the rest of the area only the outer limits of the groups of islands have been fixed, the details of the islands themselves being only sketched in from the aeroplane.

We found on approaching the narrows between Chavez Island and the mainland, where we had had trouble on the last trip, that they were now quite impassable, and we were forced to make a long detour round the seaward side of the island. On September 10th we had reached a point 18 miles from an island which we had named Sphinx Island close to our depôt and where we had arranged to meet Bingham and Ryder. The next morning Stephenson carried on with his survey, Fleming went off examining rocks, while I started for Sphinx Island with my dog team and camping gear. I had two large bays to cross, and off Cape Garcia I found leads covered with very young ice which could not have been more than a few days old. On rounding this cape I saw dense fog ahead, but could just make out a mountain peak showing above the fog and which I knew to be immediately behind Sphinx Island when taking a line from the headland which I had just passed. From this I was able to get a correct compass bearing of my course before entering the fog bank. About a mile and a half from Sphinx Island the fog was thinner, and in a few minutes more I met Bingham, who had heard me shouting to my dogs and had skied out from camp to meet me and show me the way in. We soon had my tent pitched, and then Bingham told me of his and Ryder's doings since they started their survey, and I again quote from his diary:

"It was not until Saturday, August 31st, that the aeroplane returned and gave Ryder the chance to start his mapping.

"*September 1st.*—Ryder spent the entire day taking observations of every imaginable kind, while I booked his bewildering maze of figures.

"*September 2nd.*—Being good weather, Ryder was keen to take the

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opportunity of getting some observations from the top of one of the islands further off the coast, so I took my team and drove him seawards to Jagged Island, which he climbed and took a round of angles from the top, while I was able to get some rock specimens for Fleming. Out here also we found the ice poor, and in one place the sledge broke through completely. It would not take a very hard wind to smash the whole lot to pieces. On the way back we were able to kill a seal and so give the dogs a good meal of fresh meat.

"September 3rd.—Broke camp early and headed north into the next bay, level with where we had parted from Rymill and his party. Sphinx Island lies in the middle of this bay, and we had hoped to camp on it, but though we inspected three sides we found no possible landing-place, and so camped on the sea-ice under the shelter of its northern ice-face.

"September 4th.—Ryder went off in the morning to take some angles and collect the depôt left by Rymill, while I sledged round to inspect the south side of the island in the hope of finding a camp site, but only found an even more active glacier face. The weather kept us almost completely inactive until the 8th, when it was clear enough to be worth while sledging to the bank of the bay so that Ryder could take some observations, though as yet we had been unable to find our position astronomically. On this trip we were able to get another seal, much to the dogs' joy. We managed to do little more until the 11th, when we were at last able to take sights and Ryder got all he needed. As we were finishing off the last azimuth I thought I could hear a voice in the distance, so started off on skis through the rapidly thickening fog, and soon met Rymill coming to meet us as arranged."

Next day we started north again and in the evening were back at Stephenson's and Fleming's camp just south of the narrows. Stephenson wished to spend one more day there to complete his survey, so in the morning, while he was surveying and Fleming collecting geological

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specimens, Bingham and I went seal hunting and found several mother Weddells with newly born babies lying out near open cracks in the ice. We also inspected the narrows and found them still impassable.

The next day, September 14th, we started for home with the survey completed. We met Bertram and Roberts near the entrance to Beascochea Bay, and all arrived back at the Base on September 16th. The last few miles were difficult going, for we found the channel between the Argentine Islands and the mainland completely open, forcing us to make a wide detour and approach the islands from the south.

About ten days after we returned the ice was so broken we were again confined to the Argentine Islands, where we knew that we would have to stop for several months during the long transition period until the breaking ice had moved off the coast enough to let the sea become navigable once more. There was still plenty of work to be done and we were never idle. The biologist and ornithologist were kept particularly busy studying the seals and birds now that the breeding season was beginning. Most of the Argentine Islands were looked upon as their preserve where the nests and birds were not to be disturbed, but one of the three large islands forming the main group was thrown open to egg hunters, and Bingham kept us well supplied with skuas' eggs, besides being able to store a good many away in flour barrels for use later in the summer.

Our plans for the ship's party had to be considerably altered at this time, for Roberts had been suffering from recurring appendicitis during the winter, and Bingham and I considered that it would be unwise for him to spend longer than necessary in the Antarctic. So we decided that after the shore party had been landed as far south as we were able to get, the *Penola* would return to Port Stanley, where she would spend the winter, and where Roberts could have his appendix removed under normal conditions. He would change places with Bertram, the scientist of the ship's party, who would now take Roberts's place on the shore party.

It would also be necessary for the *Penola* to go to Deception Island, for we found that the timber in our house was so swollen with the damp

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that it would be practically impossible to take it down without splitting the boards, and that any new house made with them would not be weatherproof. The nearest timber we could get was at Deception Island. Hampton and Bingham, being experienced and thoughtful polar travellers, had made, while there, a survey of everything that might be useful to us in the future, and had found a stack of unused timber in a partly collapsed shed. Most of the timber was exposed to the weather but was still in a fit state to use, so they had measured it up and estimated the amount. Therefore Hampton, knowing what material he could get, was able to design us a new house. As the *Penola* had to go to Deception Island, she would also be able to fetch a mail which Mr. Lincoln Ellsworth had very kindly left there for us when he visited the island in October. He had then been on his way to Snow Hill Island, which lies to the east of north Graham Land, whence he and Mr. Hollick Kenyon had started their great flight to the Ross Sea. We had followed their movements with the greatest interest, for the route which they proposed to take lay across Hearst Land and we hoped that we might hear something about the country which we were going to penetrate. All the time Mr. Ellsworth was in Western Antarctica we were in constant wireless touch with his ship the *Wyatt Earp*, and could also pick up messages from his aeroplane. After his two flights I wirelessly to Sir Hubert Wilkins, who was Mr. Ellsworth's organizer on the *Wyatt Earp*, asking him if he could tell us anything of the new discoveries in Hearst Land, and he replied saying: "Ellsworth confirms Stefansson Strait but reports it about 10 miles further north and only 3 miles wide." This confirmation was, we thought, a great help to us, and we were pleased to know that we were assured of a route to the Weddell Sea.

By the end of December the sea-ice was open enough to let the *Penola* start for Deception Island, but the ice in the channels of the Argentine Islands was still solid and showed no signs of breaking up, so we set about cutting a way through it with ice-saws. We had to make a channel wide enough for the *Penola* to pass along. As this meant cutting

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through 300 yards of ice 4 feet thick, it took the shore party several days while the ship's party was preparing for sea.

The ship's party had had a busy time all the winter, for apart from the general routine work of cooking, collecting ice for fresh water, catching seals and general cleaning, which seems to require much more organization on a ship than it does on shore, they had running gear and sails to repair, and the multitude of odd jobs which are always cropping up to attend to. In all this work Martin, who bore the brunt of it, proved himself to be invaluable. Several major pieces of work claimed their attention: first, the engines had to be lifted, and a composite construction of steel straps and concrete built in beneath them; then the foremast, which we had found to be going rotten at deck level, had to be repaired. This was done by the second mate and Hampton, our two best wood-workers, and took them several weeks, first paring away the rot, then filling the resulting holes with carefully shaped ash strips, carried well above and below the affected part. Besides this, the second mate and Gurney built an 18-foot half-decked boat for use with an out-board motor which proved most useful to the ship's party after the *Stella* was left with the shore party at the Southern Base. Things on expeditions seem to acquire strange names, and this boat came to be known as the Mock Turtle.

On January 3rd the ship's party, strengthened by Moore, Bertram and Roberts, left in the *Penola* for Deception Island. After clearing the Argentine Islands, they motored out to sea through light pack-ice, and when clear of the many islands headed north for Deception Island. They had an uneventful trip of some 200 miles, and spent a fortnight loading the timber and a small amount of coal which we thought might be useful if, for some reason, we were forced to spend a third winter in Graham Land. While this work was going on, the two engineers, Millett and Moore, got the machine-shop on shore in working order, thus enabling them to do several repair jobs, and giving Millett a chance to make a substitute for our much damaged gear boxes should they collapse altogether. When the loading was finished the two scientists were

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given an opportunity to study the animal and plant life, and then, on January 23rd, the *Penola* started on the return journey, which we had planned would be inside the islands, so that Ryder would have a chance to improve the existing charts. The run back was not particularly eventful; the ship was held up for a few days by head-winds in De Gerlache Strait, and in looking for shelter they found and charted a small anchorage in Dallman Bay. By reason of this delay, and also by being held up for the same reason at Port Lockroy, the *Penola* did not arrive back at the Argentine Islands until January 27th.

While the *Penola* was at Deception Island, Stephenson, Fleming and I made a short journey into the interior of Graham Land with the idea that we might perhaps be able to reach the central plateau. We found a way up a rock cliff at the end of a mountain spur opposite the Argentine Islands in much the same place as Dr. Charcot did in 1909. After travelling over steep but slightly crevassed glaciers for 12 miles, we eventually reached the glacier which led direct to the tremendous ice-falls up which we thought a climbing party might penetrate to the top of the plateau. But we never reached the ice-fall, for the glacier was so badly crevassed that if we had continued we would have been certain to lose dogs, and possibly sledges as well, a thing we could not afford to do on a journey of minor importance when all our dog power would be so necessary during the next sledging season. I believe if the main object of the expedition had been to reach the central plateau at this point we could have done so, but under the circumstances it would have been foolish to try.

Once the *Penola* returned, and the timber which was carried as a deck cargo had been unloaded, all the shore party, under Hampton's guidance, started cutting the main beams for our new house. While this was going on we were prepared to take any opportunity which the weather offered for a flight south to see if the ice had left the channel behind the Biscoe Islands. But we had a long period of strong north and north-east wind bringing rain and sleet. On February 11th the weather cleared a little and Hampton decided to fly. He took off with Ryder as pas-

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senger so that he could look for the best route to take with the *Penola*, but they soon ran into bad weather with low clouds, and when Hampton was forced down until he found himself flying level with the tops of the largest bergs he decided to return. On the 16th the weather was better and the same two flew again, this time reaching Pendleton Strait. They saw that most of the ice had left the channel behind the Biscoe Islands, but Matha Strait and the channels south of it were still blocked with unbroken winter ice. On this flight, Ryder sketched in much detail of the islands, the positions of which we had fixed during the spring sledge journeys.

CHAPTER THREE

LOOKING FOR A NEW BASE

I HAD decided to start southwards in the middle of February. We had now had a year's experience in the country and, from the knowledge we had gained, it seemed that the most ice-free time would probably be March or April. I do not advocate pushing a ship into the Antarctic pack as late in the year as this, but navigating in the pack-ice must not be confused with coasting along west Graham Land, where the dominant wind blows from the north-east and east, tending to carry the ice away from the coast soon after it breaks up. Therefore, late in the season, a ship is not likely to be held up until it approaches the firm ice, and then only streamers of newly broken ice will be met with. This only applies to the west Graham Land coast which runs approximately north and south, and not to the coast or shelf-ice edge further south where it turns to the west.

There were many other considerations to be taken into account before deciding when to leave the Argentine Islands. We knew nothing of the coast south of Jenny Island, except that we expected to find Casey Channel in Lat. $69^{\circ} 40'$ S. and then a series of islands down to the edge of the continent in Lat. 71° S. We hoped to establish our base on one of these islands, thereby allowing an easy sledge route to the east through either the Casey or Lurabee Channels or Stefansson Strait.

Some time would probably have to be spent in finding this base site, and when found a great deal remained to be done before the freeze-up; the *Penola* had to be unloaded, the house built, seals killed to provide man and dog with food during the winter, and all the smaller considerations necessary before an expedition is in a fit condition to meet the severe Antarctic winter. So I thought if we left the Argentine Islands in the middle of February we could reckon on being in the north of

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Marguerite Bay early in March. Dr. Charcot had reported the possibility of a good anchorage for a small ship in a group of islands some 10 miles north of Jenny Island, which he called the Léonie Islands, but he had only visited them by sledge in December when the ice in the north of Marguerite Bay was still unbroken, so that he had no idea of the depth of water to be found. If these islands proved a safe anchorage they would make an excellent place to keep the ship while the aeroplane was scouting further south.

The *Penola* was loaded—except for the dogs—and ready for sea on February 16th. All the shore party took up their quarters on board as temporary sailors in the early afternoon, except Hampton, Stephenson, Bingham and myself; we were going to load the dogs, and Hampton and Stephenson were also stopping behind to bring down the aeroplane. The ice-anchors and various mooring-ropes were soon taken in, and the *Penola*, with the *Stella* acting as a tug, moved slowly out of the creek to the lagoon on the west side of Winter Island. Here she would be able to lie at anchor for the night and get away in the morning without any delay. In the meantime we on shore would wait until the decks were made ready for sea, and then load the dogs. As we were short-handed we expected to take most of the night, the people on board sleeping in preparation for the next day.

We had 76 dogs to load, and as some of them were well-grown puppies who were not yet used to much handling, we had a lively time getting them into the scow. When we had loaded about 20 dogs the outboard motor was started up and we went out the $\frac{3}{4}$ mile to the ship, where the dogs were handed up the side and chained in family groups on top of the deck cargo. We had the last load on board by 4.30 in the morning, and the *Penola* got under way about 6 a.m.

It was a beautiful sunny day with a light following breeze—excellent weather for surveying; the second mate and Bertram were kept busy taking compass bearings and keeping the echo-sounder going, while Ryder navigated from the crow's-nest. His main worry was not the ice, which was only present in the form of growlers and a few floes still

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coming from the back of the bays, but rocks and sunken reefs. These rise so steeply out of the deep water that the echo-sounder rarely gives any indication of them until too late, but the risk of grounding was greatly eliminated by observations taken from previous aeroplane flights. After a most successful day, spent in surveying and sorting out the many small island groups, we arrived at an anchorage which Hampton and Ryder had selected from the air on the north side of Pendleton Strait some 60 miles from the Base.

On approaching the harbour we followed the usual procedure of stopping the *Penola* and sending the *Stella* ahead to sound the approaches and also the harbour itself. The most sheltered place was a narrow creek, rather too small for the *Penola* but very good for the aeroplane, so we anchored just off it in a cove fairly well protected by the small surrounding islands. Ryder suggested calling it Mutton Cove, a name which recalled his early days in a training-ship at Devonport. As soon as the *Penola* was anchored I went up the creek with Riley and Carse to put down a mooring-buoy and to lay a dépôt of food, petrol and paraffin for the aeroplane. If all went well Hampton would not land here, but it would make a good emergency harbour in case of bad weather. The anchor for the buoy was a 40-gallon fuel drum, half filled with stones, which we supported over the back of a dory; unfortunately it proved too heavy for us to manage, and dropped before we were ready, disappearing into deep water and dragging the buoy down with it. As it was already 11.30, and too dark to do any more that night, we returned to the ship.

The next morning we were up at 6.30, but the barometer was falling steeply and the wind was beginning to blow from the north, so we decided to wait for a little while and see what it was going to do. I went off in the scow to moor another buoy for the aeroplane, while Ryder and Riley took the *Stella* away surveying and sounding round the anchorage. We both got back to the ship by 10.30, but the wind from the north-east was increasing and heavy rain was beginning. The *Penola*, with her low power, was not a ship to expose to unnecessary danger, especially with

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the heavy deck cargo she was carrying, so we decided to stay where we were. After lunch Fleming took the opportunity to go off geologizing with Riley in the *Stella*, but the day was too unpleasant and they were soon back on board.

The weather was still bad the next morning, with a strong north-east wind and intermittent snow and rain showers, but on the afternoon of the 20th it began to improve and Ryder and Riley went off in the *Stella* to prospect a route through the complex system of rocks and reefs which separated us from Pendleton Strait. The next morning the barometer was steady and the wind and snow had stopped, so we decided to start, but as the weather still looked unsettled we made for the open sea. The *Discovery II* had in 1931 come in by Pendleton Strait, turned south and left by Matha Strait, so there was no real point in our continuing inside the Biscoe Islands and covering the same ground, especially as Hampton had already seen from the air that the passage inside Adelaide Island was still blocked by winter ice.

We had about 9 miles of difficult navigation ahead of us before we could be clear of the islands. Soon after we left, heavy clouds began to approach from the north, but the squall kept off and we managed to reach the open sea without difficulty. Here our survey and soundings finished for the time being, with some final bearings on to the low glaciated Biscoe Islands as we motored between Rabot and the Nansen Islands.

There was a big swell running outside, and the *Penola* rolled heavily, but made good progress until nightfall. As the summer was well advanced there was a brief dark period at night, and when the light became too bad for us to distinguish growlers clearly, the ship would be stopped till daylight the next morning—a precaution well worth taking in these waters, where a growler large enough to do serious damage to the hull of the ship would be almost impossible to pick out in a rough sea until it was too late to avoid it. This meant stopping from about nine at night until three next morning.

A head-wind got up in the early afternoon of the next day and in-

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creased until we were making no headway, so Millett stopped the engines at 4.30 as we were only wasting fuel. The *Penola* was moving about a great deal but was taking in little water, so the dogs were fairly comfortable. They were chained up short, which prevented them from falling about and injuring themselves, but most of them suffered from sea-sickness. All the colour left their mouths and lips, the nearest they could get to having pale faces, and they lay about looking utterly miserable. The wind dropped completely in the night and we were under way again by three in the morning, coasting along Adelaide Island, about 10 miles off shore, under a clear sky with bright sunlight sparkling on the water.

Dr. Mill has written of Biscoe's discovery of Adelaide Island in his Introduction and has suggested that Biscoe thought it to be only 8 miles long. After seeing the island from much the same position as Biscoe did and reading his description, which is vague and can be taken in several ways, I am of the opinion that he might have been only describing the mountain group at the north end. The 4 miles of ice which he mentions could be the distance from the base of the mountains to the sea in an east-west direction, and have nothing to do with the length of the island from north to south. However, as he produced no map, which is the only sure way of representing a traveller's impressions of the topography of a new country, to pursue the question of what he may or may not have meant is fruitless, especially as we now know the true shape of Adelaide Island.

When darkness came again we were only 30 miles from Jenny Island, and by ten next morning we were well past it and approaching the group of small islands which was our objective. Very little heavy ice was to be seen, but the water was fairly thickly strewn with brash, while a few miles to the south an irregular line of white showed the proximity of pack-ice, but how heavy it was we could not yet tell.

Meiklejohn had arranged to call up Stephenson twice a day, at 10 a.m. and 2 p.m., so I was able to send him a message saying that we were just arriving and that flying conditions were good.

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The *Penola* stopped about a mile from the islands, and the two Ryders, Bertram and I went off in one of the dories with an outboard motor, to look for an anchorage. The channels looked promising, but when we sounded several places the water was too deep for the *Penola's* cables; then we found a bay which looked suitable, but on sounding the approaches there proved to be only 8 feet of water over the bar. This was unfortunate as the bay itself was most attractive, with a well-sheltered, narrow entrance opening into a good-sized lagoon with a gravel bottom and surrounded by gently sloping shingle beaches quite free of snow. Although the ship could not get in we now had an ideal place to put the aeroplane when it arrived. After several hours of searching we found a possible anchorage at the other end of the islands with a difficult entrance and very little room inside, but just enough water over the bar at high tide.

When we returned to the *Penola*, Martin had the *Stella* over the side ready to do her work as a tug, and Ryder soon had the ship safe in the anchorage. Using the *Stella* in this way proved most useful on many occasions and enabled Ryder to manœuvre the ship into most impossible-looking places. He would direct operations from the crow's-nest with various flag signals: one set of signals for Riley in the *Stella*; another for the man at the wheel; another for a man stationed at the engine-room hatch, who passed the instructions down to the engineer in charge; and still another for Martin, who was stationed forward ready to let the anchors go. I was always amazed that he was able to give the right signals to the right man, especially when things were happening quickly. By the time the warps were laid it was 4.30 and time for tea.

After tea Ryder, Bingham, Riley and I went off in the *Stella* to explore the islands further in case the pack which we had seen to the south proved too heavy to get through, so forcing us to winter here. We returned to the aeroplane bay, and after looking round for some time decided we had found the ideal base site if we were stopped from getting any further south. The bay which I have already described made a harbour for small boats and the aeroplane, and there were many places

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on the raised beaches suitable for building a house. We also discovered several fresh-water ponds free of ice, with strange little beasts swimming about in them. There were, however, remarkably few birds compared with the coast further north: we saw only a small group of depressed-looking shags in the bay where the *Penola* was anchored, and one or two Adélie penguins on the rocks.

The evening was well advanced by the time we were ready to return to the ship, and as there was no sign of Hampton and Stephenson we thought that they would not be flying down until the next day. The weather was still fine and sunny in the morning, but there was not much to be done until the aeroplane arrived, when we could reconnoitre further south. While we were waiting, Bertram and Roberts spent some time roaming round the islands, collecting specimens of the fresh-water crustacea and the few lichens that were to be found, while Riley went off with a party in the *Stella* to collect fresh water for the ship.

About 4 o'clock in the afternoon we heard the distant hum of the aeroplane, and in a few minutes Hampton was circling round the islands looking for a patch of ice-free water on which to land. The brash ice was fairly thick and he was forced to come down about a mile from the ship, but the *Stella* was waiting and went out to help him in. He taxied up and moored alongside the *Penola*, and Stephenson and he were soon on board telling us how they had fared since we had left them eight days before. Stephenson had picked up most of Meiklejohn's messages successfully, and after boarding up the house and beaching the dory, which we had left behind in case of emergency, they started south. Here is Stephenson's account of the flight:

"It was a glorious day at the Base, with little wind. I couldn't hear Meiklejohn at 9.30, and Port Stanley, instead of repeating Meiklejohn's weather report to me, repeated a personal message, which though very pleasant didn't tell me much about the weather down here. However, we knew conditions had been suitable yesterday at 2.30, and as we had had perfect and steady weather since, we assumed

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it would still be suitable. We packed up the wireless set and our personal gear, and nailed the final boards on the house, on which we had painted 'To Let, for the season 1936-7.'

"By 1 p.m. we were in the plane, and as we taxied out of the creek we wondered if we would ever get off with such a load. It was a flat calm without a ripple in sight. Slowly we taxied over the course, making sure there were no pieces of ice floating about. We went almost out to the Barchans, and after Hampton had made one or two final crab-like movements, he pointed the plane straight towards the entrance of Meek Channel, and then opened up the throttle. On and on we skimmed over the water, but never a sign of a lift, and we approached the ice at the far end of the channel without getting off the water. Not so good! However, we slowly wended our way back to the beginning again, and after a pause which felt like taking a very deep breath, once more we shot down the channel in a cloud of spray. After 30-40 seconds we left the water, but soon came down again; a second time we got up for a few yards, but she couldn't hold it and came down only just in time to pull up before running into the loose ice ahead of us. That was certainly better—but what to do next was the problem. Should we go back to the Base and get a pump from the hangar to take out some of our petrol, or should we make one more attempt? We decided to make a third effort, although neither of us was very hopeful. Once more we raced down the channel, and this time we definitely got that feeling of something powerful lifting us up. Twice we left the water and came down again just skipping on the surface, and then as we approached the ice it felt as if we were really going to get off. If only Hampton could keep her full open for a few more seconds we should be up—on the other hand, if we didn't get off it was high time he closed her down if we were not going to finish up in the ice. Should he keep on? It would save an awful lot of time and trouble if he did . . . yes, he was going on, and at last the water and ice receded from us as we climbed into the air. It was grand to feel that we were actually up with all our petrol and all our gear on

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board. We felt as if more than half the battle was over and that we were nearly there instead of still circling round the Argentine Islands.

"I used my camera and took photos every two minutes as far as Cape Evensen, to add detail to the map in case we didn't get the aerial survey done up here. We flew low and circled round 'Mutton Cove' and saw the buoy which *Penola* had laid for us in case we had to come down there.

"Matha Bay was full of loose ice, and on the south side for a few minutes we were lost, as we could not find the narrow channel behind Liard Island and we couldn't fit things in with Charcot's map at all. The shore seemed to continue right round, as if Adelaide Island were really part of the mainland. It was beginning to look as if we should either have to go round Adelaide Island or over the top, and in any case we had to make up our minds pretty quickly as a plane doesn't stop while you think. We couldn't land as the sea was covered with loose ice, and we were just deciding to turn out to sea when we saw a narrow channel running in an E.-W. direction in what we thought was a bay in Adelaide Island. We investigated this opening and found that it soon turned at right angles down another narrow channel, beyond which it opened out into a large expanse of open water—at the head, presumably, of Laubeuf Fjord.

"This, then, appeared to be the only gap separating Adelaide Island from the mainland. It was very narrow and had a sharp bend, so we had to fly quite close to the sides to get round. On the way through I made a rough sketch of our surroundings, but as our view was so limited the general position and scale could not be guaranteed, and later surveys were required to corroborate it.

"After getting through the gap we flew straight down Laubeuf Fjord and landed at the Léonie Islands at 3.45 p.m., having done 210 miles in 2½ hours."

When Hampton and Stephenson arrived, it was too late in the afternoon to do any more flying, so after tea Riley in the *Stella* towed the

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aeroplane over to the aeroplane bay and moored it for the night. We were keen to get a flight south as soon as possible to see how much further we could take the ship, but we were held up for a day by a strong north-east wind which made flying impossible. However, time was not wasted; the scientists had plenty to do on the islands, and Hampton spent his day working on the aeroplane engines, trying to cure an oil leak which had started round the joint in the crank case.

The next morning, February 27th, was bright and sunny with little wind. After breakfast Hampton and I took off on what promised to be the most interesting flight which we had yet made, as we hoped to go well beyond Charcot's furthest south. The brash ice was thick round the islands, and Hampton had to taxi well over a mile before he found a clear enough stretch of water from which to take off. As we rose above the bergs we could see Alexander I Island, about 80 miles away, showing up clearly against a cloudless sky with the sun shining on the steep glaciers which flow down between its great dark mountain masses. When we reached a height of 2000 feet Hampton stopped climbing and steered a course for the entrance of Charcot's Nyen Fjord. The pack-ice which we had seen from the *Penola* proved to be last winter's ice still breaking out of Marguerite Bay in the form of small floes fairly loosely packed together, through which the *Penola* would be able to pass without much difficulty. After flying for a few minutes we saw a shore lead several miles wide extending down the coast, and as we flew on we were thrilled to see what appeared to be a great mountain chain connecting Alexander I Island to Graham Land. We could not, however, be at all certain of our discovery, for, as so often happens in this region, although the day appeared bright and sunny with a cloudless sky, in the distance there was a thin mist, so thin that it looked only a few shades paler than the clear sky, and was almost imperceptible until one noticed that it gradually blotted out part of some feature one was actually examining. The mountains appeared to us to be 90 or 100 miles away, and we could see great peaks showing vaguely above the mist which completely blotted out the lower levels. This was the first

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new land we had seen, but we should have to wait for clearer weather before we could be certain of our discovery.

After following the open lead to just beyond the position of Neny Fjord, we found that it stopped abruptly at a long promontory of reddish-coloured rock which we later named Red Rock Ridge. Beyond this ridge the ice-floes were larger and more tightly packed, and increased progressively in size until in a few more miles the edge of unbroken winter ice was reached. Having decided that the *Penola* could not force her way past this promontory, we circled back and examined the coast north of it for a base site. We saw that Neny Fjord was really a glacier-filled valley with only a small fjord at its mouth, but there was an island about 2000 feet high some 4 miles off the coast, and the channel between it and the mainland was dotted with small low ice-free islands and submerged reefs. Both the large island and most of the small ones had raised shingle beaches with several good base sites and one or two possible anchorages for the *Penola*. The safest-looking anchorage appeared to be a crescent-shaped bay on the east side of the large island. After Hampton and I had satisfied ourselves that we had found a practical position for a base and that the *Penola* could not get any further south without waiting for some weeks, we flew back the 50 miles which separated us from her. Soon afterwards Hampton took off again with Ryder to show him the position which we had decided on for the base so that he could make a sketch map of the rocks and reefs, which were fairly numerous along the coast. They returned before lunch, but we decided not to leave with the ship then as we could do the distance comfortably in one day. There was no point in risking the ship in the pack during the hours of darkness, as a strong wind might get up and take us on to one of the many reefs. In the afternoon Hampton and Stephenson moved over to the aeroplane bay where they would camp for the night, and then bring the plane down when we wirelessed our arrival. Meiklejohn arranged to call Stephenson once every hour, starting at 10 a.m.

We were up early and under way by 5 o'clock. The trip was un-

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eventful as the day was gloriously fine. The *Penola* pushed her way slowly but steadily through the pack, and by the time we reached the position where we had seen the reefs beginning, we were clear of the ice. The *Stella* was then put over the side, and Riley, the second mate and Bertram went ahead in her to prospect a route. Riley had fitted a small Lucas sounding-machine to the side of the *Stella*, so he was able to travel at a fair speed, and by keeping about a quarter of a mile in front of the ship was able to signal back if he found shallow water, in plenty of time for Ryder to avoid it. We continued in this way for some miles, and on approaching the anchorage which we had seen from the air, the ship was stopped and the approaches and harbour thoroughly explored for submerged reefs. While we were putting out the warps the aeroplane arrived and we were all safely on board for dinner, eleven days after leaving our old base in the Argentine Islands.

We had now arrived in the locality where we wished to build our base, but we still had to find a suitable site, so in the morning Hampton, Stephenson, Riley and I went off in the *Stella* to prospect round the islands. After visiting several, we found a good raised beach about 100 yards long and 40 yards wide, on the east side of a little rocky island some 60 feet high. The beach overlooked a small bay enclosed by several other islands, with the ice-cliff of the mainland only about half a mile distant. The bay was just big enough to hold the *Penola* moored bow and stern, but had a strong current running through it bringing in large pieces of glacier-ice which would bump against the ship's stern, endangering the rudder and propellers, and also fouling the mooring-warps stretching between the ship and the shore. Because of this we were forced to keep an anchor watch at night. Unloading started at once; first of all the dogs were landed, and most of them chained up. Bingham and Stephenson moved into a tent pitched on the beach so as to be able to look after them and stop any fighting that might start. They would also be on the spot if a strong wind got up in the night, thus endangering the aeroplane, which we had taken out of the water and tied down on the beach.

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When Hampton and I had flown down on February 27th we thought we had seen either a stretch of shelf-ice some 2 or 3 miles wide, or else a broad piedmont glacier beginning about 15 or 20 miles beyond Red Rock Ridge and running south parallel with the coast; but the haze made all the more distant topographical features too indistinct for us to be sure. However, there was a chance that the ice would break back and allow the *Penola* to get further down the coast later in the season. So instead of unloading everything at the Base we left a large supply of sledging rations and other provisions on board, thus enabling a sledging party to lay a depôt, and then to live comfortably on the shelf-ice until the winter ice became thick enough to make sledging back to the Base possible.

In spite of almost continual high winds and snowstorms the ship was unloaded in $4\frac{1}{2}$ days. The shore party then started building the house, while the ship's party made preparations for their long sail back to Port Stanley. I spent most of this period of the expedition in bed and left the organization in Hampton's capable hands. About the time we left the Argentine Islands I developed a pain in my left leg which Bingham diagnosed as sciatica. By the time we reached Marguerite Bay it was considerably worse and I retired to bed, only getting up when necessary to make reconnoitring flights, and when my decision was required on any special point.

Hampton started building the house on March 5th and was ably assisted by the other members of the shore party, except Riley and Bertram who, as soon as unloading stopped, started seal hunting in the *Stella*. We had seen very few seals since rounding Adelaide Island, and these were mostly Weddells lying about on the shingle beaches. The motor boat worked in a radius of about 10 miles round the house, but the hunters succeeded in killing only 25 seals before we took the *Stella* out of the water for the winter. As this supply was very inadequate for feeding 9 men and 98 dogs, we were forced to ration it during the winter and to fall back on our emergency supply of biscuits and dried codfish for the dogs, and to eat a good deal of tinned meat ourselves instead of

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the unlimited and excellent seal meat which we had formerly been enjoying.

The weather, which is one of the governing factors in an essentially outdoor occupation like polar exploration, remained unsettled, with frequent sleet and snow storms, and it was not until March 9th that we had any weather fit for making an attempt to fly down the coast and see what was happening to the sea-ice. The clouds were low down over the land in the morning, but after lunch they lifted well clear of the tops of the mountains, so Hampton and I decided to see if we could take off in spite of a gusty wind. Our usual aerodrome south of Barry Island was thickly dotted with small pieces of ice, caused by falls from the face of the high ice-cliff along the coast. These falls are a common occurrence in the summer, and several times a day a loud crash would tell us that another piece had come away, but they were generally small, and one could not locate the spot until knobbly pieces of brash started spreading fan-wise from the cliff face. Though not big enough to worry the *Stella*, this ice was a constant danger to the aeroplane. On this occasion Hampton taxied northwards looking for clear water, but once we were out of the shelter of the islands we got into a nasty short choppy sea caused by an east wind off the mainland. After manœuvring into a position for a take-off, Hampton opened the throttle, but as we gathered speed the waves caused too much strain on the undercarriage, forcing us to stop and return to the Base. The wind lasted all day but died away in the night, though the weather remained cloudy and foggy. We waited most of the next day—March 11th—hoping it would clear, but there was no improvement, so at 4 o'clock we decided to have another try. We took off without difficulty, but when we got round Red Rock Ridge we saw low clouds ahead right down to the base of the mountains. We were disappointed at not seeing anything of our new land, though the main object of this flight was to see if the ice was broken enough to let the *Penola* reach the shelf-ice. As we flew low over the pack we could see little change since the flight on February 27th; most of the loose ice had cleared away, but the unbroken ice edge had hardly receded

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at all, and it would still be impossible to get the ship past Red Rock Ridge. So after flying for a few miles over the firm ice, Hampton turned the machine for home.

The season was getting too far advanced for the *Penola* to wait any longer on the coast as we had no idea when to expect the freeze-up, so I reluctantly decided to unload the provisions for the depôt and let her start for Port Stanley as soon as possible. The unloading was done the next morning and final preparations made for sea, while Hampton finished the day by joy-riding those members of the ship's party who had not previously been up in the aeroplane. All the shore party left the ship in the evening and took up their residence in four pyramid tents except Fleming and Bertram who lived in the newly built porch, which Hampton had finished so that it could be used as a temporary kitchen. Several of the shore party returned to the ship for the night and stood anchor watch to let the ship's party get a good night's rest before leaving. Everyone except myself was up at daylight, and by 7.30 the warps and anchors were in and the *Penola* ready to move out. A great many bergs had drifted close to the islands since we arrived. Only one of the possible approaches was unblocked by ice, and even this one was very jammed up, but there was no wind at all, so with the *Stella* towing the *Penola* Ryder was able to manœuvre her out without much difficulty. As soon as she was well clear of the islands the tow rope was let go; the shore party crowded into the *Stella*, and with a final wave and shout returned to carry on with the work on shore, while the *Penola* soon slipped out of sight behind the bergs.

CHAPTER FOUR

AUTUMN AT THE SOUTHERN BASE

AUTUMN was fast approaching, but we still had several important things to do before the freeze-up. As we were dependent on the sea-ice for the first part of any journey we should not be able to lay any autumn depôts unless we could find an inland route. This seemed unlikely, for we had seen while flying that the high plateau with its steep cliffed side still continued a few miles back from the coast. We envied the great Ross Dependency expeditions with their bases either right on the shelf-ice, as in the case of Amundsen, or else within easy reach of it. This made it possible for them to do long depôt journeys in the first season, starting almost as soon as their ship arrived; while here we were sitting on a miserable little island, the surrounding sea too thickly strewn with ice to the south to let us get through by ship or motor boat, but with the ice too broken to make sledging possible. Besides not being able to start travelling till the sea-ice formed, we had also to reckon on being back at the Base before it broke up. In deciding what time this would happen we had very little data to work on, as Dr. Charcot's was the only party known to have entered Marguerite Bay, and they had been stopped by unbroken bay-ice 30 miles north of our present position. Judging by this and by our experiences further north, I thought that the middle of January would be the latest that we should think of returning from any journey. This gave us a very short sledging season, and as January and February should have been our two best sledging months, to do all that we hoped we should have to sledge all the winter, starting as soon as the ice was safe.

Ever since we had arrived at the Debenhams (the island group on which we had built our base) we had been waiting for a chance to make another flight in good weather and to get a closer view of the new

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country which we had seen vaguely on the flight from the Léonie Islands, but up to the time the *Penola* left, this had not been possible. For this reason we could not at present work out a sledging programme, for we had seen enough from the air to realize that the country in which we hoped to travel was completely different from that described by Sir Hubert Wilkins. To the east, instead of several ice-filled straits giving easy access to the shelf-ice at the back of the Weddell Sea, we were hemmed in by an unbroken line of high mountains and precipitous glaciers; while to the west we found that our only exit was the main opening of Marguerite Bay, for the large island (Alexander I Island) described by Sir Hubert Wilkins as having its southern extremity somewhere about $69^{\circ} 30' S.$ was actually part of the mainland. This was especially unfortunate as we had hoped to sledge to the south of it, and to follow along the edge of the Antarctic Continent south of Charcot Island to the end of the Dependency. Therefore the most important items in our immediate programme were flights to the south and to the north; the former to work out possible sledge routes, and the latter to unravel the complicated fjord system which we had seen while looking for the southern base, and also to discover what happened between Adelaide Island and the mainland. Both of these flights we hoped to make off floats before the long transition period between floats and skis set in, when the young ice continually forming and breaking up makes either form of flying impossible. Both these flights would have to be short as the aeroplane was due for an overhaul; the oil leak round the crank case, although the oil pressure was staying up, was an additional source of anxiety, making it merely foolhardy to attempt long flights over the sea, where at this time of the year a forced landing would most probably mean disaster. An overhaul would be impracticable until we had built the hangar, for the weather was too bad to let Hampton attempt any serious work on the engine while the aeroplane was in the open, as there was no covering of snow over the beach and the frequent strong wind would scatter grit over the working parts as soon as the engine was taken down. So we planned to make two short reconnaissance flights, not going more than

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about 70 miles from the Base, and then to stop flying until the winter.

The day after the *Penola* left was gloriously fine, so Hampton with Stephenson in the cabin made the first of these two flights. They took off in the morning, and on passing Red Rock Ridge saw that the visibility over Marguerite Bay was perfect. Here is Stephenson's description of the flight:

"A very lucky day, Friday the 13th. It turned out to be glorious weather with remarkable visibility—obviously a day for flying. Hampton and I took off at 11.20 to see what we could find to the south. We had to limit our flight to 2 hours and so could fly out only about 75 miles, but this was sufficient to show us that 'things are not as they seem.' We flew in a S.S.W. direction, and after ten minutes' flying over water were once more over a field of dazzling ice. It is a wonderfully exhilarating feeling to be 5000 feet up in the air and to look at the brilliantly blue sky, broken all round by the ice-covered and rocky peaks of mountains, and from these your eye travels down the ice-falls and crevassed glaciers to the vast white sheet of ice beneath you, and there moving along with you is the black shadow of the plane just going straight into the unknown.

"We were abreast of Cape Pierre Baudin after 37 minutes, and then, according to Wilkins, the coast should have trended S.E. to Casey Channel, instead of which it formed a big bay swinging round to the S.W. To the west of us Alexander I Island, a precipitous mass, 6000 feet high, extended to the S.E., and ahead of us the two joined, completing the bay.

"When we turned round, in the latitude of Casey Channel, the only sign of a break was a narrow fjord ahead of us. This I described in my survey diary: 'There was no sign of a break in the coast-line at all until it had swung W. of our course (which was 202° true), and then at the back of the bay there was a narrow entrance filled with sea-ice running N.W./S.E. We were unable to see how far it ran, but the ridges on the N.E. side of it, when seen from the north, seem to drop sheer away on their south side and there is an appearance of a big

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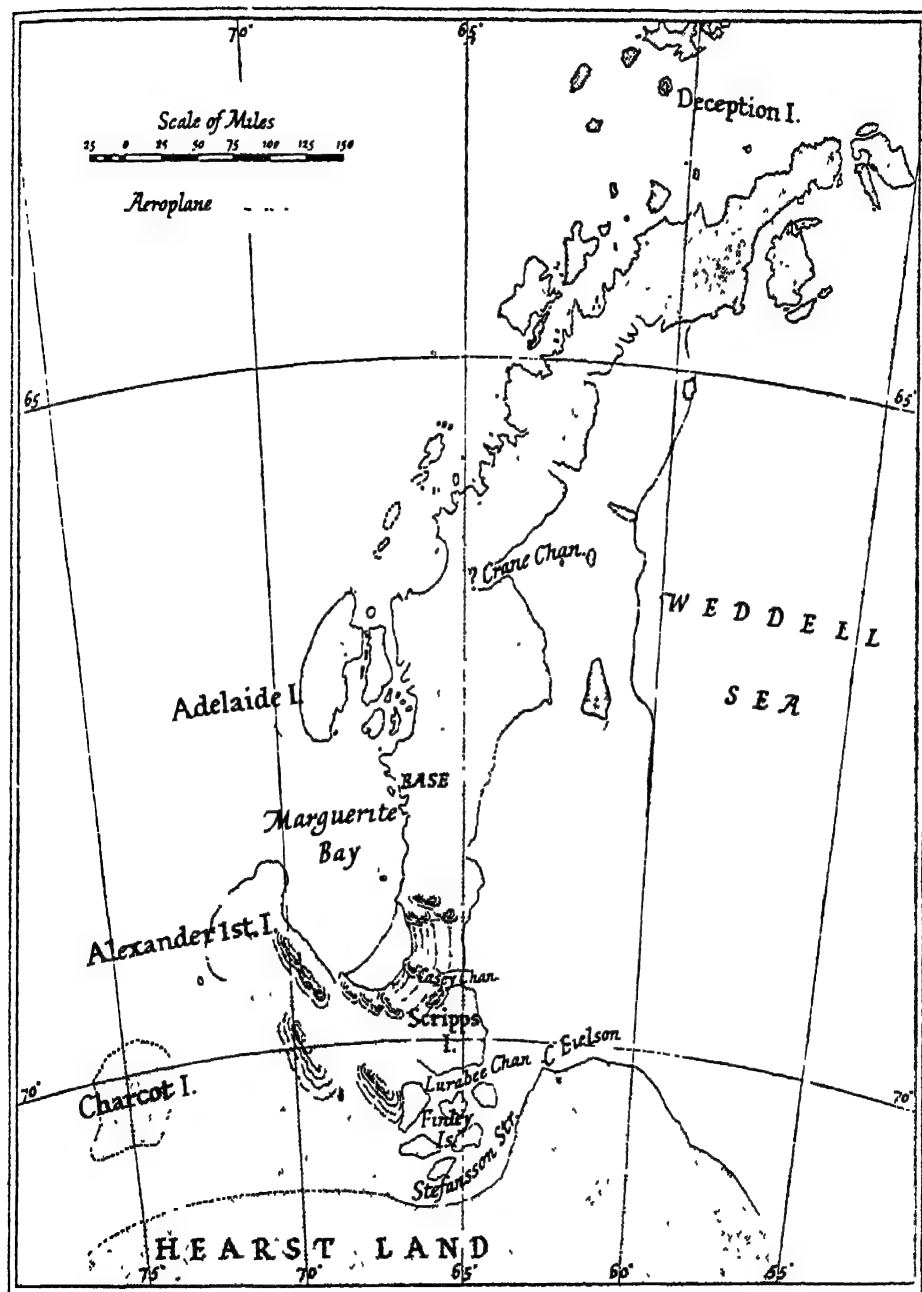
rift in the topography. Beyond this rift the land rises to massif heights again. Further west from this channel, the coast-line was continuously steep and unbroken, to the northern tip of Alexander I Island.'

"To continue from my own diary: 'This (the rift) is the only thing which prevents us from saying that Alexander I Island is not an island. The S.E. corner of the bay is filled with shelf-ice, which is fed by broad, gently sloping glaciers which I think we might well sledge up. South of us we could see high ridges 5000/7000 feet high, stretching certainly another fifty miles to the south, so where Stefansson Strait is going to come, I don't know.'

"We turned and arrived back at the Base at 1.30. The same afternoon I attempted to plot what we had seen, but as our speed was uncertain owing to the lack of accurately mapped features on the ground, the result was doubtful. We assumed the large cape we flew past after 37 minutes was Cape Pierre Baudin, but later we proved it to be Charcot's Berteaux Island, which meant we had not flown quite so far as we thought. This, however, did not seriously affect the general results of the flight."

After this flight, work at the Base went forward steadily. Riley and Bertram took every possible opportunity which the weather gave them to go sealing, and Stephenson started putting up his meteorological screen and observation hut just behind the house on a rocky ridge, which was the highest point of the island. We expected to be some time building the house, for, although we had cut up and mortised the main timbers before leaving the Argentine Islands, all the planking was in odd lengths and needed cutting to size. However, the amateur carpenters worked with a will, often in sleet and snow, when they climbed about the framework considerably hampered by flapping oilskins.

Although the winds which we had experienced up to this time had been frequent, they had not been particularly strong, but on March 19th it freshened from the north-east until there was a big wind blowing, averaging about 60 m.p.h.; the temperature was below freezing, and



Graham Land as it appeared after March 13th, 1936

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the sea-spray, as it blew across the island, froze on the house and the piles of boxes. Luckily the outside walls and the roof had been finished by this time, so there was no chance of the wind getting a grip under any unprotected part, and everybody was able to work away inside, building the ceiling and inner walls. After the wind had been blowing for some time the aeroplane, which was tied down on the beach, began to move, so Hampton weighted the wings with ration boxes and put heavier weights on the tail, wing and fuselage anchors, and it then gave us no further trouble. But the *Stella* was not so fortunate, for in the afternoon she dragged her anchors and went ashore in the small bay where she was kept, at some distance from the house. She had her rudder knocked off and the upper pin which holds it in place snapped. Also some of the iron shoeing was ripped off the keel, but luckily no serious damage was done, though Riley and Bertram spent two days carrying out repairs before they could go sealing again. They were averaging about two seals a day when the weather allowed them to go out and hunt round the islands and along the beaches in the fjords near by. In the evening they would tow their catch home and put the seals in a meat store which we were slowly accumulating on one of the small islands near the Base, where it was out of reach of the dogs.

The house was finished and scrubbed out on March 23rd, and we all moved in on the 24th. Hampton had made an excellent job of it, and I believe it was well up to the standard of most previous expedition houses, both for strength and comfort. It consisted of a main living-room, 27 feet long by 15 feet 6 inches wide and 6 feet 6 inches high, with 2 windows and 9 bunks arranged round the wall, with wooden partitions between them reaching to the ceiling, while the floor-space was occupied by a stove, a table, 6 canvas chairs and a bench. There was a curtained opening leading from the living-room to the kitchen 7 feet 6 inches wide and 9 feet long, where Moore installed the Aga cooker. Opposite the kitchen was Meiklejohn's wireless room, 5 feet wide by 5 feet long. Above these three rooms was a good-sized loft where we stored the tents, camping equipment and any perishable

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stores that could not be left outside. A door led out of the kitchen into the porch, which ran the length of the front of the house and was 5 feet wide, with a window at one end; under the window Meiklejohn installed his charging motor. The main outside door and the two inside ones leading through the kitchen were so arranged that a 12-foot sledge with handlebars could be taken into the living-room for repairs. At the end of the porch furthest from the window a door led into the hangar, which ran the whole length of the house and was 15 feet wide. The aeroplane on floats could fit in with the wings folded, and leave room along the sides for a work-bench and a small amount of space for storing cases of aeroplane spare parts, while the rafters held our supply of timber, skis, oars, etc. A great improvement on our old hangar was a small winch installed in a lean-to at the back. This enabled the plane to be taken in and out with only very little man-power, for we placed the hangar and house so that the big double doors faced the beach, where we built a wooden slipway out of the aeroplane packing-cases. Hampton could taxi the plane right on to the slip, where the axles and wheels, designed to fit on to the floats, were put on, and then, by leading a steel wire from the plane through two snatch blocks and on to the winch, two men could wind it up the 30 or 40 yards from the water right into the hangar. Similarly, the plane could be pulled out by leading the wire round a block made fast to an anchor down by the water. This operation was greatly simplified in the winter and spring when the tide-crack was so snowed up that Hampton could taxi the plane, now on skis, right up to within a few feet of the doors and we only required the winch to pull it across the hangar floor.

One of our troubles with the house was to find an efficient way of ventilating it; we had brought the roof ventilator from the old base, but this did not seem much good. It provided an outlet for the bad air, but the air could not be persuaded to go up it, so a great many complicated schemes were thought out and argued over. Some of them were most scientific and ingenious but rather involved. After listening to them all, Hampton decided that the best and simplest way was to leave the

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door into the porch open, thus making a good, easily regulated ventilator, for if we needed more fresh air we merely opened the door more widely.

When we moved into the house it was completely finished, but the hangar was only about half built, so Hampton continued working on it, with Moore to help him, while the others went back to their own work. Meiklejohn started installing his wireless and charging motor; Fleming started local geologizing; Stephenson finished getting his meteorological station working and began surveying; while Bingham was busy getting the dogs settled into their new homes. His family had been enlarged to 102 as Betty had presented us with a litter of four fine, strong black puppies on March 27th.

During all this time we had been waiting for a chance to carry out the second flight which we had planned. Although there were plenty of days when flying was possible it was not until the afternoon of March 31st that the mountains to the north appeared completely free of cloud; the morning had been heavily overcast, but soon after lunch the weather began to clear, and although it remained cloudy to the south, it was soon fine in the north. Hampton, again with Stephenson as surveyor, took off at 4 p.m. They were back at six after a most successful flight. I again quote directly from Stephenson:

"The wind had blown hard for some days, but on the morning of the 31st it began to die down and, although it was still blowing at midday, we decided to fly, since it was getting late in the year and the summer flying season was nearing its end. There was an exceptionally low tide, and it took us some time to prepare a slipway of boards to get the plane down to the water, but we eventually got off at 4 o'clock. We intended to fly north to the unknown fjord region east of Adelaide Island. We had flown down Laubeuf Fjord, but knew nothing of what happened to the east.

"Between our Base and the entrance to Laubeuf Fjord Charcot had marked the entrances to two fjords, namely Bigourdan and Bourgeois Fjords. Where these led to he did not know, so he dotted

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in the shore-line, suggesting that they ran N.E. to join the upper end of Lallemand Fjord, which runs in a N-S. direction from the south side of Matha Bay.

"We flew up Bourgeois Fjord, but after 30 minutes it came to an end in steep rock walls and small branching fjords which finished in glaciers. The main fjord runs in a north-easterly direction, and at its head it is quite close to the plateau edge, but as one goes south there is a broadening belt of very broken country between the plateau and the fjord. Generally speaking, the plateau edge here is about 5000 feet high and runs in a N-S. direction. All the broken country west of the plateau seems to have been faulted down, leaving an almost vertical rock wall. This rock mass is broken here and there by ice-falls that pour over from the plateau, and occasionally a steep glacier manages to escape from the top. At the foot of the rock wall is a valley in which glaciers, formed from the ice-falls and plateau glaciers, flow into the heads of small fjords and bays which branch off from Bourgeois Fjord.

"The promontories forming these smaller fjords, and the islands in the bays, are all bare rock and steep, forming a fjord type of country more like Norway than anything we had seen in Graham Land. The recent winds had blown every single piece of bay-ice out to sea, and it was difficult to believe we were in the Antarctic. The western side of the fjord, however, was a very different matter, for the east coast of Pourquoi Pas Island is heavily glaciated, with scarcely an exposed piece of rock to be seen. This island is about 20 miles long, and at its northern end is a very narrow channel running through to Bigourdan Fjord. Since we could find no exit at the head of Bourgeois Fjord we flew through this channel, hoping to find an exit at the head of Bigourdan Fjord. Here again there was no water passage to the north, but there was a glacier-filled valley running northwards, and we decided to fly up this and see where it led us.

"We flew up the valley at a height of 6000 feet for 25 minutes. On either side were mountains between 5000 and 7000 feet high, whilst

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the glacier beneath us must have risen to 4000 feet at its highest. Eventually the glacier fell to sea-level again into the back of a bay which, though ice-filled beneath us, had open water at its mouth, some miles to the north. Far to the north we could see the southern Biscoe Islands, and immediately to the N.W. of us the massive Gravier peaks. We had undoubtedly come into the head of Lallemand Fjord, and flown through the valley which Charcot from a distance had thought was a possible ice-filled strait.

"We turned and arrived back over the Base at 6 p.m. The sun was a large red ball and the whole of the 'new land' to the south stood out absolutely clearly, bathed in a golden glow. We came down rapidly from 5000 feet and lost the sun immediately. At sea-level it was dark and cold, and as we taxied in the spray froze as soon as it came to rest on the plane."

We were now in a position to work out a rough outline of future plans. This flight and the previous one had shown us that there was no possibility of crossing Graham Land north of lat. $69^{\circ} 30' S.$, a position 100 miles south of our present base. Here the high mountains and precipitous cliffs of north Graham Land gave place to more gently sloping though badly crevassed glaciers flowing down from a plateau with isolated mountain massifs rising out of it to a height of about 8000 feet. Although it did not look an easy country to travel in, it appeared that a crossing in this latitude would at least be possible.

The first thing that I had to decide was whether we should try to make one long journey to the eastwards across these mountains, and then follow the coast-line of the Weddell Sea with Luitpold Land as our objective, or whether we should explore the country to the south, and also to the west behind Charcot Island as far as the end of the Dependencies, and then make a shorter journey to the eastwards to survey some of the east side of Graham Land without trying to reach Luitpold Land. If we carried out the Luitpold Land journey, everything else would have to be sacrificed to it, as all the expedition's

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transport resources and man-power would be used up in depôt-laying and supporting parties. The journey would necessitate a crossing of these mountains in the south-east corner of Marguerite Bay; sledging parties would have to work laying a depôt at the foot of these mountains, but we should not be able to make a reconnoitring flight across them to find a sledge route until we had a reasonable amount of daylight in the early spring; then if we failed to find a route our entire winter would have been wasted. But on the other hand, since our discoveries from the air had shown the whole distribution of land to the south and east to be so totally different from anything that had previously been reported by explorers or conjectured by geographers at home, it seemed a great pity not to explore it thoroughly and clear up once and for all the many controversial points which would be sure to arise. To try to carry through the Luitpold Land journey merely because it was our original plan, which had been based on a totally different conception of the topography of south Graham Land, seemed to me to be stupid, especially when it meant throwing away the chance of exploring this new and interesting country. So we decided to give up any idea of trying to reach Luitpold Land.

Our rough plans for the future were as follows. As soon as the ice permitted we would sledge down the coast and establish a depôt on the shelf-ice at the point 100 miles south of the Base where a crossing to the Weddell Sea seemed possible. Besides using this depôt for the attempt at crossing, it would also be used by Stephenson; for we planned that when there was sufficient daylight for surveying he would take a party consisting of himself, Fleming and Bertram, with three dog teams, round the newly discovered coast-line of Marguerite Bay, coming back from the north of Alexander I Island direct to the Base. This would be a journey of approximately 350 miles, and the party would carry out detailed survey and geological work. But before these three sledges left on their own journey, they would act as a supporting party for Bingham and myself. We proposed to sledge round the north tip of Alexander I Island and then turn south-west till we reached the edge of the Antarctic

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Continent, which we should follow to the western end of the Dependencies in long. 80° W.; this would be a journey of about 800 miles, and Stephenson and his party would support us for the first hundred miles. Stephenson's journey round the bay should be over before Bingham and I got back, and we hoped that he and Fleming would be able to make a survey and geological trip to the north, while Bertram carried on his biological work nearer the Base. When Bingham and I returned we should all join forces and attempt a crossing of Graham Land and the survey of the south coast of the Weddell Sea.

Hampton also had a comprehensive flying programme consisting of reconnoitring flights and aerial surveying, with Meiklejohn to work the camera. The first long flight with skis would be undertaken by Hampton and myself and would be round the north end of Alexander I Island to examine the sea-ice and, incidentally, to photograph the country. We were mainly concerned with the state of the ice, for the longest journey in our programme as it stood at this time depended on this one outlet to the west, and we were doubtful if the ice would be solid enough for sledging round such an exposed point, especially after our experience not so very much further north the season before.

We had at least eight weeks ahead of us before we could start sledging, so we settled down again into a normal Base routine, going as far afield for survey, geological and biological work as the weather and ice would allow. Meiklejohn had his wireless installed and working by April 1st, but he had not arranged to start his schedules with Port Stanley until the 4th. When he spoke to Stanley on this date he received a message from Ryder to me saying that the *Penola* had arrived there on March 24th after having gone under sail alone for 1100 miles, and that they were all well. This was an extremely good passage as they had covered the 1250 miles from the base to Port Stanley in twelve days, and it reflected great credit on the small crew of seven.

By April 6th all the finishing touches had been put to the house and hangar—the roof had been covered with sheets of galvanized iron, and then the whole structure held down with strong steel cables passing over

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the roof and fastened with bottle-screws to improvised anchors, well buried and frozen into the shingle beach on which the house was built. Bertram had built himself a small biological laboratory in the form of a lean-to against the side of the house, and the dog house from the Argentine Islands had been re-erected against the hangar; Bingham had designed and, with Moore to help him, built a series of kennels on the roof of the dog house where any bitch, when she came in season, could be chained out of reach of the dogs. This was a great improvement on the previous year when the bitches were put in the house or hangar, where they were always rather a nuisance, especially now that we had 23 of them, which meant that there were practically always some in season.

As Stephenson had finished his preliminary survey of the Debenhams, he, Riley, Fleming and Bertram tried to get further afield up some of the long fjords, but before they got clear of the islands the young ice became too thick for the *Stella* to force her way through; also, as there were 20° of frost, the water intake kept freezing up and they were obliged to return. However, there are always a great many false starts when the sea begins to freeze, and two days later the temperature rose, allowing the *Stella* to continue her work once more; but by April 11th another spell of cold weather set in, making the young ice too thick for her to continue, so we pulled her up on the beach, where Riley dismantled the engine, covered her with a tarpaulin, and generally made her snug for the winter.

The forming of the ice also stopped sealing operations, which had been disappointing, for we only had 15 in store, and, except for a few odd ones which might come up on our island, there would be no chance of getting any more till we could start sledging. This forced us to conserve our meat supply and to use the supplies of dried codfish and Spratts biscuits for feeding the dogs. The biscuits were given with blubber as the weather was turning cold, but the change from an all-meat diet gave the dogs diarrhoea from which they never really recovered while they were being fed on biscuit.

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Bingham's knee had been getting worse for some time and he decided that it was essential to give it a thorough rest, and as no pup-training or dog work could begin until the ice was bearing properly, he handed over the feeding to Moore and retired to bed for a month with his leg in a splint. We now had two temporary cripples, for I was still in bed with sciatica, but as we were well into the autumn transition period it had no serious effect on the expedition. About this time, having finished the hangar, Hampton began overhauling the aeroplane, and when he took the engine down we were worried to find that the cylinders and pistons were badly scored and worn. We only had two spare pistons and cylinders, and so he used the two best of the old ones and fitted these two new ones; then before assembling he ground the valves and cleaned the cylinder heads, which had rather a heavy deposit of carbon on them. The bearings were in perfect order.

Although we were now unable to leave the island we were never idle, for when spending over two years in the polar regions without shops or supply ships, there is a tremendous amount of maintenance work to be done, especially on an inexpensive expedition like ours where only bare necessities were taken and the same gear had to be kept in good condition all the time. Here is a description for a typical day during the inactive period: Fleming, who is cook of the week, is up at 7.30 and has breakfast ready on the living-room table at 8 o'clock, having called the rest of us about ten minutes before. Methods of calling vary with the cook; some are so pleased with themselves for having got up early that they make a great deal of noise about it, while others are so quiet that if one wants to lie in bed for a while it requires very little concentration not to hear them at all. Methods of getting up differ also; some like to get out of bed and wash before breakfast, while others, including myself, lie in bed till the last possible minute and wash after breakfast, which consists of porridge with milk and sugar, followed by toast with margarine and jam, and tea to drink. The cook is exempt from washing up, but supplies two large basins of hot water which are brought in and put on the table. Two men start washing up, while the

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others dry, except for two who clean out the living-room grate, lay the fire and sweep the floor; this takes about twenty minutes. When it is finished we all disperse to our various jobs. There are no regular working hours, for everyone is responsible for his own department and is able to get on with his work when and how he likes. Stephenson and Riley take it in turns to do the meteorological observations, and on this day which I am describing, Stephenson comes back after reading the instruments at 9 o'clock and announces that the temperature is 27° of frost, with a clear sky and little wind, and that the sea-ice is forming well to the north of our islands, but is still much broken to the south. Fleming, after stoking the Aga cooker and filling the water tanks, mixes the daily 6-lb. loaf of baking-powder bread, and after putting it in the oven prepares lunch, which today consists of thinly sliced seal meat and dried vegetables mixed in a thick brown gravy and baked in a hot oven for about twenty minutes. There is no official meal during the morning, but about 11 o'clock everyone drifts into the living-room and Fleming produces ginger wine, cocoa and sweet biscuits; Hampton and Moore have both been busy in the hangar, Moore building a cowling to fit over the tractor engine for additional warmth, while Hampton has been working away on the aeroplane. Meiklejohn comes in from his wireless room where he has been doing complicated operations with bits of wire and a soldering iron; Bertram has been working in his laboratory, while Bingham and Riley have both been outside; Bingham working with the dogs and Riley checking over some of his provision piles.

On these occasions when we are all together there is never any lack of conversation. Although we have lived in the same company for well over a year, a good wireless communication with the outside world allows us plenty of interests apart from the expedition; most of us, in fact, take more interest in world affairs than we did when at home.

After about twenty minutes we return to our different jobs until lunch, which is at 1 o'clock. That meal is cleared away and the things washed up by about 2, when work continues till tea at 4.30. Fleming,

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who has prepared tea and dinner, is free to go geologizing on the island, and at about 3 o'clock Bingham collects one or two people to help him feed the dogs. They are getting only one feed of fresh meat a week at this time, and as this is a meat day, a side of seal is pulled down off the roof and cut up with axes into pieces weighing about 4 lbs. These pieces are stacked in four or five old dog-biscuit boxes on a sledge, which is then pushed round to the various groups of chained dogs and the pieces distributed. As soon as the dogs see the meat being touched a wild clamour breaks out, which gets progressively less as they each get their own piece of meat.

As the nights are now drawing in it is too dark to do much work outside after tea, so Riley and Bingham come into the house and the latter settles down to sewing dog harnesses, while Riley goes into the hangar to give Hampton a hand with the aeroplane. About a quarter past seven, Fleming looks out of the kitchen and shouts "Clear the table," which means that anyone who has belongings on it must remove them to let him lay for dinner. The dinner consists of roast seal meat with Yorkshire pudding, mashed potatoes and green peas, followed by a baked jam roll with good, light pastry made possible for amateur cooks by the excellent combination of McDougall's self-raising flour and a really efficient oven. We generally drink tea, but tonight Fleming gives us coffee for a change, with orange squash for those who prefer it. After dinner, things are washed up, we draw our chairs round the fire and settle down to a pleasant evening, most of us reading or writing up notes, others mending clothes or darning socks, while the sewing-machine on the table whirrs away to the accompaniment of the gramophone playing somebody's favourite dance tune. So the pleasant and quiet days slip away, bringing the more strenuous sledging season ever closer.

At the beginning of May the Antarctic wind showed us what it could do. On the first of the month it was blowing a normal gale at about 60 m.p.h., but the next day it rose to a shrieking blizzard and our self-recording anemometer registered an average of 110 m.p.h. We had

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had nothing like this in Graham Land, but those of us who had been with Watkins had experienced such winds while wintering in East Greenland, and Hampton had designed his house to withstand them. Although it shook several times we were never anxious about it blowing away, for not only were the foundations firmly frozen in, but it was well wired down. The wind on this occasion lasted for six days, at speeds varying from 50 to over 110 m.p.h. We were rather worried by these winds, for they blew straight off the coast, breaking up the ice and carrying it out to sea, which meant that it would be some time before we could think of long journeys.

By May 14th Bingham considered that his knee was rested enough, so he started giving it gentle exercise. For a few days before he got out of bed Hampton was busy making him a steel harness to support it. This harness was an ingenious arrangement mainly thought out by Bingham, consisting of strip steel up each side of his leg, hinged at the knee, with a wire support round the back and four seal-skin straps holding it in place, with two more going up his leg and fastened to a belt round his waist. This arrangement, though causing him a great deal of inconvenience, gave his knee sufficient support to enable him to carry on dog-driving; in fact, he went on one journey of 535 miles mostly on snow-shoes over soft surfaces. My leg also recovered about this time and I was able to get about again, with plenty of time in hand to strengthen it before we began sledging.

The ice on the anchorage in front of the house had now withstood several gales, and on the 16th Bertram set up, 100 yards in front of the house, the self-recording tide-gauge which he had brought from the Argentine Islands, and with which he succeeded in getting three months' continuous readings. The next day we considered the ice was bearing well enough to let us start dog-driving and training the rest of our pups. There were still 23 to train, including 6 in Bertram's team, 5 in Bingham's, 5 in mine and one complete team of bitches except for a young dog leader, a brother to five sisters in the team. This team was to belong to Hampton and to be kept at the Base for

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sealing and other odd jobs, and also to be available in case of emergency. The rest of the untrained pups did not fit into any particular team but would be kept in reserve to make up losses.

Training this number of animals took up most of our time, and kept us busy until we started the first journeys. The principle of training was the same as that used in the Argentine Islands; Bingham would go out with the owner of the team until the pups were used to pulling, then he would hand them over to their driver, and start on the next lot.

Hampton had the aeroplane ready to fly by June 1st, and he and Riley went off with the tractor to a large level expanse of ice about three-quarters of a mile to the south of the Base. They marked out a landing-field with old dog-pemmican boxes and flags, which would enable Hampton to judge his height while landing in the winter twilight, for the sun had been below the horizon for about a fortnight and there were only three hours during the middle of the day when the light would be at all possible for flying. When Hampton had the ground marked out we were all ready to make our first flight off skis, but we had to wait patiently for nine days until the weather was clear enough. June 9th was a calm day with a little local mist, which cleared off during the morning. Hampton taxied the plane out to the flying-ground while Stephenson, Moore, Fleming, Bingham and I went and stood down the line of boxes to act as additional marks. Fortunately there was no wind, so Hampton could land in whatever direction he liked, and by coming down towards the north was able to make the best use of the winter half-light for showing up the dead-white surface of the snow. Even so, he had a difficult job to judge his height, but being an exceptionally good pilot he made two perfect trial landings. Then Fleming and I climbed into the cabin and he took off again.

We could not stay up long as the light was fading fast. But this did not matter, for the object of the flight was merely to look at the condition of the sea-ice over Marguerite Bay and see if it were fit to let us start our first dépôt journey. We climbed to about 1500 feet and flew out past Red Rock Ridge, where we got an excellent view and could

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just distinguish the great mountains of Alexander I Island in the distance. The sea-ice had now been holding for about twenty-six days, with the temperatures getting lower until 60° of frost or colder was quite usual, and as we flew over the bay we were delighted to see firm ice everywhere with no open leads. We could tell that the ice was bearing well because once it gets a carpeting of snow any weak places are shown up clearly. For if the ice is thin, it will have a greater amount of slush between the hard ice and the surface snow, which will then look greyer than the drier snow covering the more solid ice. As we flew over the bergs, which were held in the grip of the bay-ice, we were pleased to see that there were no open cracks round them large enough to distinguish from the height of 1500 feet at which we were flying. This is always a good sign, for the bergs are constantly subject to pressure from wind and currents, and if the ice is at all weak it will crumble away where the bergs are continually rubbing against it. After flying for about fifteen minutes, Hampton returned and made a good landing—now made easier for him as the snow surface on the landing-ground had been considerably cut up by his last two take-offs and landings, which gave him additional marks by which to judge his height. After landing he taxied the aeroplane back to the hangar, and we were soon in the house enjoying a hot meal and rejoicing over the good news that we could now start sledging.

I have already, in this chapter, stated the object of this first depôt journey. We planned to travel in two separate units, as this system is quicker than that of using one large unwieldy party. We arranged to spend one day making final preparations, and then Stephenson, Moore and I were to start with three dog teams, to be followed the next day by Hampton and Riley, with the tractor towing two sledges, and finally by Bingham and Bertram with their dog teams. We had between us, for leaving at the depôt, 4050 lbs. of dog food and 1200 lbs. of man food, besides camping gear and full rations for two weeks to be used by ourselves on the journey. This meant that the teams of ten dogs would be pulling about 1100 lbs., while the tractor was towing about 2200 lbs.

CHAPTER FIVE

A WINTER SLEDGE JOURNEY

JUNE 11th.—A wonderfully clear morning with the thermometer showing 62° of frost and the air so still that one does not realize how cold it is until the gloves are taken off to do some small job about the sledge, when one's fingers soon lose all feeling. Getting away from the Base at the start of a sledge journey is always slow work, and we were not ready until 11 o'clock. But we are only proposing to go as far as Red Rock Ridge, a distance of about 12 miles.

When we got out on the sea-ice we found a heavy surface—soft snow lying on several inches of slush—before the solid ice began. The dogs worked well, but the pups were worried at first, for they had only pulled light sledges and could not understand what had happened and kept looking round enquiringly at the heavy load behind them. We adopted our usual practice of stopping for a few minutes each hour to let people make any small adjustments to their loads, dog harnesses or traces. When there are several teams travelling together, some kind of regular routine is essential, for it is most annoying for the following drivers if they do not know when the leader is going to stop. Above all, any leader of a sledge party should give at least an hour's notice of the time when he intends to camp. If the many little unwritten rules like this one, which a good sledging man will evolve for himself, are carried out with consideration and forethought, most of the petty grievances which are so likely to creep into the daily life on a sledge journey under trying winter conditions will never arise. This applies particularly to the general routine of pitching and breaking camp, and the cooking and other domestic arrangements inside the tent; if the work is not divided evenly by mutual agreement, the over-polite and willing man, who is always saying "Oh, let me do that," and who is always trying to do

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things which should obviously be done by someone else, is just as irritating as the lazy man who leaves what he can to the others.

At about 1 o'clock the wind got up from the south-east; it was not strong enough to start the snow drifting, but it made our faces cold and we had to take our hands out of our gloves every few minutes to feel for dead spots. If a small area with no feeling was found—generally over the cheek-bones or on the point of the chin—a warm hand held against the offending spot for a few seconds would restore the circulation and put the trouble right. At about 3 o'clock, when we were approaching the cliff on the north side of Red Rock Ridge, Stephenson, who was driving the middle sledge, shouted to me that he thought Moore was in difficulties. I stopped, and when Moore came up he told us that, although he had been running most of the way, both his feet and hands had lost all feeling. As he was showing symptoms of a general collapse, Stephenson and I got the tent up as quickly as we could and he got into his sleeping-bag while we fed the dogs and prepared the camp for the night. It is very bad luck for Moore that he should freeze up like this, for he is one of the keenest men on the expedition, and I am sure would be one of the best sledgers if it were not for this trouble with his circulation, but as it is, I am afraid there is nothing for it but to take him home tomorrow.

June 12th.—The wind blew fairly hard from the south-east during the night, and we were lulled to sleep by the sound of the drifting snow swishing round the tent. When we woke up, the wind had eased off considerably, but there was just enough left to keep up a low drift, while a temperature of 47° of frost made us glad of our efficient windproof hoods. Moore and I were ready to leave by 9 o'clock. I was going to take him back to the Base with his camping gear and one tent, while Stephenson remained in camp with the two dog teams. The second party should arrive at our camp in the evening, when Riley could take over Moore's team, leaving Hampton to look after the tractor by himself. As we are going to join forces, this will make quite a good party—six men in three tents. The wind in the night had packed the surface

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snow hard, and our old wet tracks of yesterday were frozen solid, so we went along at a good pace considering our load, and arrived at the Base at 11.30. We passed Bingham and Bertram about a mile out along our trail, and I told them to connect with Stephenson at our camp. We found Hampton and Riley still at the Base tinkering at the tractor engine, but they got away soon after we arrived. Fleming, who was cooking, produced a large jug of hot cocoa for Moore and me, and we enjoyed this while Meiklejohn collected Moore's gear off my sledge. We decided that Moore should rest his feet for a few days and then take over the management of the dogs left at the Base until Bingham got back.

I got away about 12 o'clock and caught up the tractor about half-way to the camp; my team was running easily on the well-beaten trail, but the heavy tractor was breaking through to the slush and had to work in second gear. On arriving at the camp at 2.30, I found Bingham and Bertram putting up their tent, for as we were obliged to wait for the tractor to catch us up (it would have been unwise to let it go round an exposed point like Red Rock Ridge unsupported in case of weak places in the ice) the day would have become too dark to go on. It arrived about 3 o'clock, and after feeding the dogs and covering the tractor with a tarpaulin, we settled down to a long pleasant evening in the tents.

June 13th.—The sky was overcast this morning, and the temperature has risen to 39° of frost. The tractor engine was warmed up and we were all ready to start by 10.30. Bingham and Bertram got away about ten minutes in front of the rest of us to pick a good route for the tractor between the islands round Red Rock Ridge, but there was only one small crack, which the tractor negotiated without difficulty. I tested the ice just after we rounded the point, and found it was about 18 inches thick. Here the wind had cleared off most of the snow, but away from the point there could not have been any wind for a long time. The snow was lying thick and soft, and although the tractor could plough its way through comparatively easily it made terribly heavy going for the dogs. We therefore followed in its wake with our dog teams, and soon caught up with Bingham and Bertram. The tractor then broke

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trail for us until 3 o'clock, when it was time to camp. With this terribly slow going we have managed to cover only 7.4 miles today.

June 14th.—We got away at the usual time, about 10.30; the sky was overcast, so the temperature was not low (only 34° of frost), but it gradually cleared and the temperature dropped accordingly until, when we camped in the evening, the thermometer showed 62° of frost. The surface had much improved since yesterday, and the dog teams led the tractor again. About 12 o'clock we saw a seal lying on the ice a quarter of a mile off to the west, just beside a large berg, so I left my team for Stephenson to drive as well as his own, and set off on skis to kill it. After killing and gutting it, I left a mark so that we could pick it up on the way back, and then started to catch up with the sledgers again. I had my extra sweater on, so I got very hot hurrying after them, and arrived back looking like a snowman completely covered in hoar-frost. Having done 8 miles, we stopped at about 2.30, as the pups were getting very tired. It had been a trying day for them over a surface of deep, soft snow lying on the usual slush, but there had been dry patches occasionally where the under surface was drained by pressure, and we found a good spot to camp on.

We had a wonderful view this afternoon. When the sky cleared, the clouds over the Graham Land mountains to the east remained dark, but took on lighter shades as they faded into long streamers towards the zenith, where their edges were touched with the reds and orange of the sunset light from the north. Down the western horizon the great mountain ranges of Alexander I Island stood out mysteriously, showing a pale copper colour against a dark grey haze into which they gradually disappeared further south, while the soft winter twilight made the whole scene look coldly beautiful, but rather awe-inspiring. As we sledged along I was impressed by the thought that here was all this strange grandeur round us, and we—people of the twentieth century who had left an overcrowded land only a few months before—were the first to see it since the world began.

June 15th.—Away at 10.15. A cloudless sky with a temperature of 59° of frost, but—an ominous sign—great streamers of snow being blown

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off the mountain-tops. Soon after leaving camp we ran on to a harder surface, and the dogs soon pulled ahead of the tractor, but after about a mile and a half we got among pressure ridges. The ridges were low, not more than 3 feet high, with good lanes of smooth ice between them. But I considered it wise for Riley and me to drop back and support the tractor, while Bingham carried on in the lead. We continued in this way for some time, when the wind from the hills eventually struck us, raising a high drift which reduced visibility to a few yards. Bingham had difficulty in forcing his dogs forward. However, he pushed on through the increasing wind and drift until the visibility was almost nil; then, as we were on a stretch of wet, slushy snow, we decided to follow our trail back to some good, dry ice which we had passed about a mile behind. We returned on our back-bearing, and pitched camp on this good surface. In spite of the wind, pitching camp was comparatively easy as we had six men all helping to put up the tents.

June 16th.—The wind blew hard all night but died down this morning about 7.30, when I called the others. We had some strenuous digging before us as everything was badly drifted up. The wind had got under the tarpaulin, covering the tractor and filling the whole thing up with snow, so Hampton, with one or two of us to help him, after digging away the main drift, cleared as much snow as possible out of the works, and then replaced the tarpaulin, putting a pressure stove under it. What snow was left was soon melted. While the tractor was warming up, the rest of us dug out our sledges, but we were not ready to leave camp until 12.30. The wind had blown nearly all the loose surface snow away, exposing the damper snow underneath. This had frozen solid for a few inches down, making good, firm going, but inclined to be salty in places. The dogs and sledges bore up well, but the tractor broke through this false top several times into a foot or so of slush lying on top of the firm ice; fortunately it managed to pull itself out again unaided. We carried on until 3 o'clock, covering 5.3 miles. When we camped we were getting close to a group of precipitous islands rising to a height of about 500 feet, but in such poor light judging distance with

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any degree of accuracy is almost impossible, and we decided that they were anything from 4 to 8 miles away.

June 17th-18th.—The wind got up soon after we went to bed and blew a regular gale all night, and it was still blowing too hard to think of moving at the usual time. However, it died down a little during the morning, though it still remained too strong for us to start. I went outside to have a look round; everything looked safe and there was no sign of pressure on the ice in our immediate vicinity. I visited the other two tents, and arranged to feed the dogs about 2.30. Soon after I got back into my own tent, which I was sharing with Stephenson, the wind came down harder than ever. We had no anemometer with us, but judging from the winds which we had experienced at the Base, it was blowing well over 100 m.p.h. As soon as it got really strong we all went outside to make everything as secure as possible. There was very little drift, as all the loose snow had already been blown off the ice, so we collected all the ration and dog-pemmican boxes, except a few which we left on the sledges to weight them down, and piled them on the tent skirts. The wind was terrific, and it was quite impossible to face it except by crouching down and using one's hands on the ice. When a strong gust hit us as we were carrying the boxes from the sledges to the tents, we had to lie down and use the box as an anchor to prevent being blown bodily backwards. We did not feed the dogs, for as they were all curled up, and as comfortable as they could be in the circumstances, we thought it best not to disturb them. When we got back into the tents, the noise was terrific. The continual roar of the wind was accompanied by the cracking and banging of the tent as it tried to get free from the encircling boxes, while what little drift there was hit the walls with a sound like hailstones beating on a tin roof. Every now and again an extra strong gust would shake the whole tent until we thought it must be torn to pieces. It was impossible to sleep, and we all lay on our reindeer skins, fully dressed, with our beds and kit-bags packed, ready to do what we could if the ice broke up. The wind kept up this tremendous velocity all the afternoon and night, but eased off a little

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about 1 o'clock in the morning. About this time, Bingham came over to my tent and said that he and Bertram had felt a shudder in the ice; he had had a look all round the camp, but could see no sign of cracking. Stephenson and I had felt nothing ourselves, and as the wind was dropping we decided that we might as well all go to sleep until just before daylight, when we should prepare to travel. About 2 o'clock we were awakened by a sudden vibration in the ice, and sat up in the darkness with our nerves tense, listening and waiting for what might happen. We soon felt two more shocks just as though someone in the distance was hitting the edge of the ice with a heavy hammer. I opened the tent door and looked out at open water in a crack about 2 feet wide. I immediately slipped on my windproofs and went outside. The wind had changed and was blowing at about 20 m.p.h. from the north-east; the temperature had risen to just below freezing and there was heavy wet snow falling, which thawed when it landed on my windproofs. It was of course very dark, but I could just trace the line of the crack which ran past our tent, because it showed up as a sinister grey line against the white snow. I switched on my electric torch and took a hurried look in the direction of the other tents. They all looked quite normal, and the dogs were quiet. So I told Stephenson, who was in the tent, that there was no immediate cause for alarm, and then went on a tour of inspection. I found that the ice had broken up into pans about 300 yards square, with wide cracks between them. Where we were camping the pans were not much disturbed, but at a little distance all round us they were rafting on each other, causing pressure ridges and open leads. With the darkness and falling snow my vision was very limited, so, after examining the ice round the camp for some hundreds of yards, I returned and reported conditions to the occupants of the other tents. We decided to have a night watchman. Although we did not expect much more movement since the wind had slackened and changed direction, we felt that we should sleep better if we knew someone was watching. I took the first hour and, with the aid of Riley's hurricane lantern—Riley always takes odd things on sledging

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journeys because they 'might come in handy'—wandered round keeping a close watch on the leads to see if the ice edges were moving much. After watching several marked spots for some time, I was relieved to see that there was practically no movement. At 3 o'clock I called Stephen-son, and then got back into the tent. The last watchman, Riley, called us all at 8 o'clock, when we had breakfast and prepared to travel as soon as it was light. About 9 o'clock the snow stopped, but the sky remained heavily overcast and the coast was enveloped in fog. However, we could see enough to have a look at the general ice conditions. We walked forward for about half a mile, and then climbed to the top of a small iceberg, where we had a good view over the pack. There were great pressure ridges forced up 12 or 15 feet high, and in many places the ice-pans, here about 2 feet thick, had been pushed on top of each other, forming wide leads of open water. It was quite clear that we should have to abandon the unwieldy tractor and most of our provisions, just taking enough for our immediate use, push on at once with light sledges, and try to reach the islands ahead. If the wind increased again with the ice in its present condition we knew we should certainly be carried out to sea—in fact, it was extremely lucky for us that the wind had moderated when it did. While the others returned to break camp I walked on to look for the easiest sledging route and returned about 11 o'clock. The wind had now practically died away and the sky was beginning to clear.

We left camp at about 11.30 with Bingham leading, and followed the track which I had made. We went forward for about 2 miles, steering on the highest island in the group ahead, but were then stopped by a wide lead running at right angles to our course. Bingham and Hampton were on the leading sledge, and were forced to turn in towards the mainland coast, which was about 8 miles away. Conditions soon became worse, so Hampton took charge of my team, while I went in front to try to pick the best way. The pressure ice ahead was too bad to think of climbing over, and we were gradually forced away from our objective, round a group of large tabular bergs which had forced the ice into

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unbelievable chaos; but after rounding these bergs we were able to work our way back towards the islands again. The dogs were magnificent and worked splendidly, though the young ones were frightened of the open water and their drivers had to force them across the leads, most of which they could jump, but occasionally they had to swim. Even when they were able to jump, the ice on each side of the open water would often be flooded, forcing the men and dogs to wade through 15 inches of water. Besides driving the dogs, the men were kept busy looking after their sledges and trying to guide them over the rough ice and across the leads without letting them upset. In spite of these efforts, a man would often be forced to stop his team and help some less fortunate companion who had his sledge badly jammed between ice-blocks or tipped over beside a lead, which necessitated standing in water above the knees to right it again. To add to our other troubles, as the twilight began to fail, our progress developed into a race against time. There was no question of stopping where we were, and once the little light there was failed, there would be no chance of finding a possible route to the islands. By 3 o'clock, when it was getting unpleasantly dark, we appeared to be reaching a less disturbed area, and the islands looked reasonably close; but after sledging for about half a mile over low, mound-like ridges of soft snow and wet powdered ice forced up between floes only a few yards across, we were stopped by a lead several hundred feet wide. It was now too dark to see how far it extended, so while the others untangled their traces I went forward, with one of our powerful electric torches, to the edge of the lead. It was just possible to distinguish the white ice-cliffs of the islands about a mile away. As the lead ran from the island to a berg about 500 yards from us, and there was a large patch of open water between it and the bad pressure area which we had been skirting, one could assume that the lead ran right from the island into the group of bergs which had forced us off our original course.

This looked serious, as the side of the island nearest to us was made unclimbable by a vertical ice-cliff some 80 feet high, and we should have

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to find a route parallel with this until we reached a low ice-tongue with exposed rocks where a landing looked possible. I turned down the lead towards the island, picking my way as well as I could by the light of the torch, and eventually found a possible crossing-place where the lead narrowed and a loose pan could be utilized as a stepping-stone. The teams were soon brought up and the sledges got across. We were now in the shelter of the island; and the snow was lying in deep drifts through which the dogs floundered slowly. When we neared the ice-tongue we found a wide tide-crack filled with small loosely packed pans only one or two yards across, which tipped when the dogs trod on them and frightened the puppies badly. The landing-place on the ice-tongue was steep and rocky; the sledges could only be taken over the tide-crack and up on to the island one at a time, and this last 200 yards took us over an hour to negotiate, with men and dogs splashing about in the dark. At last, at 6 o'clock, we were up on the island and soon had our tents pitched and the dogs fed. We had been travelling for $6\frac{1}{2}$ hours without any rest, and had covered only 7 miles. Everyone was very wet, but our sleeping-bags, which were packed in canvas covers, were only slightly damp on the outside, so we were able to go to sleep feeling warm and comfortable, with the satisfying feeling that we were on something really solid and that as we should have to wait where we were till ice conditions improved, there was nothing to get up for in the morning.

June 19th.—We woke to hear snow pattering on the tent, and lay in our nice warm sleeping-bags feeling pleasantly lazy and with a great sense of security, knowing that whatever happened our island, which we had named 'Terra Firma,' could not blow away. It snowed and blew from the north-east all day with practically no visibility. However, after lunch we went outside to get as good a view as possible of our surroundings. The island on which we had camped was steep and rocky. The night before we had had to find our camp site in the dark, and on looking round this afternoon we found that we had stumbled on the only possible place to pitch our tents. Bingham and Bertram were down on the ice-foot, while Stephenson and I were about 100 feet above

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them where we had found a small level space among the rocks, and Hampton and Riley were just back from the ice-foot a few hundred yards to the west of Bingham's tent. The dogs, though crowded round the tents, had plenty of room and seemed as happy as we were to be on dry land.

June 20th.—A foggy day with light snow falling, which made it impossible to get a look at the sea-ice, but several of us skied along the north edge of Terra Firma more for exercise than anything else. There is a shallow bay just to the west of our camp where the ice is holding well. After going about a mile, as we could see very little, we returned to camp.

June 21st.—Mid-Winter's Day. The wind swung round to the southwest this morning, which brought the temperature down to below zero again, causing a ground fog.

Hampton, Stephenson, Riley and I climbed to a point several hundred feet above our camp. We could see the mountains on the mainland appearing above the fog, which completely blotted out the lower levels. We waited for about an hour to see if it would clear, but as it appeared to be getting thicker if anything, we climbed back to the camp and put in another long evening reading, eating and listening to the strains of Bertram's penny whistle floating up from the tent below.

June 22nd.—There was still fog this morning, but about 11 o'clock it began to clear slightly. Stephenson, Riley and I skied off over the ice to see if we could find a more direct route for the sledges back to the depôt, so that it could be transported on to Terra Firma. We travelled away from the island for about an hour, when we were stopped by terrific pressure. We climbed on to the top of an iceberg to get a look ahead, but the fog settled down again, reducing our visibility to 100 yards, and we were forced to return to camp. In spite of the high temperatures—today there are only 12° of frost—the leads are freezing over quickly, and the ice on one of them was strong enough to let us cross it on skis.

June 23rd.—Stephenson and I were awakened during the night by

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the wind, which was blowing a gale from the north-west. The gale lasted until midday, when the wind became gusty. The little that we could see through the drifting snow showed us that the ice was breaking up again, so as soon as the wind slackened I climbed to a higher part of the island where I could get a good view to the north. I just had time to see that the ice round the islands was very much more broken up, when the snow started drifting again and blotted out everything.

We decided to put the dogs on half-rations tonight as we only have enough food for four full meals. This should not do them any harm as they have been idle for the last few days.

June 24th.—The wind kept up all night, but died down about 8 o'clock this morning. Bertram and I set off to see if we could find a route by going to the south round the island and then circling in towards the coast. Hampton, Stephenson and Riley also went off to try to find a more direct route, while Bingham stayed in camp to look after the dog teams.

Bertram and I started off on our skis about 10 o'clock. We glided easily over the icy surface, and after travelling for about 2 hours we returned, having found a quite practical route, but one which would take us considerably out of our way. The other party returned soon after us, having found a more direct route through the pressure ice. After some discussion we decided to try their way, but with the ice in its present condition we realized that we should not be able to get the depôt on to the island, for we could not get to it and then back to our present camp with heavy loads in one day, and the advantage to the expedition of establishing the depôt on Terra Firma did not justify camping on the ice longer than necessary. We had seen it break up twice in the last few days. As it was, we were doubtful if we could reach a group of islands just south of Red Rock Ridge in one day. There was no possibility of landing on the mainland itself south of Red Rock Ridge, as it was completely glaciated and had a fringing ice-cliff some hundred feet high. We considered that if the ice on which the depôt was placed had withstood the last gale from the north-west there would be a good

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chance of finding it in a month or so, for we had spread the boxes out well, to prevent them from gradually sinking through the ice under the pressure of their own weight. Also it was clearly marked with long bamboo poles which should show above any snow-drift. In any case, the tractor will have to wait until the spring, when the heavy accumulation of snow will have levelled out the surface to a certain extent; but it is heavy and more likely to sink through the ice.

The temperature has dropped to 35° of frost today, so if the weather holds, with any luck we might be able to get away tomorrow.

June 25th.—A fine morning with a clear sky, no wind and 29° of frost.

Hampton drove my team for the first few miles while I ran in front of Bingham's sledge, picking a route through the pressure ice. After several miles we got on to more level going and I was able to go back to my own team again. The surface was hardened by the wind and the dogs trotted along at a good pace. Everything went well for some 12 miles, when we suddenly ran into a bad pressure area. At first there were only the usual ridges several feet high, but as we continued the ice became more and more broken up, until the confusion was unbelievable. Great slabs of ice several feet thick were sticking up vertically with others pushed up on top of each other and tumbled about at all angles. There was nothing for it but to try to get through, so we forced our way slowly forward, with men and dogs climbing over the great ice-slabs as well as they could. The pups were grand and pulled away like old-timers. Every now and again we would stop and climb on top of some particularly large piece of ice to get a look ahead, but there was no chance of picking out one way as better than another, for as far as the eye could see there was just one great jumbled mass. It was amazing that the sledges were not smashed to pieces, and the knocking about which they got says a great deal for Hampton's strengthening of them. We were still in amongst this confusion when the twilight failed, but we were fortunate in having a moon which gave just enough light to make travelling possible. About 8 o'clock in the evening we started running on to large level pans some two or three

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hundred yards square which had evidently been solid enough to withstand the terrific pressure, but these were widely scattered, and the ice between them got no better. The moon went down about midnight, so we just had to stop although we were still a long way from land. Stephenson, our meteorologist, predicted a calm night. Fortunately we found one of the large level floes not far away, and as we had had a most strenuous fourteen hours' travelling we were all very pleased to get into our sleeping-bags at about one in the morning.

June 26th.—The night mercifully remained calm and the weather has stayed clear all day, with 46° of frost. The going for the first few miles was just as bad as yesterday, and Bertram broke the upturn on his sledge, but we were only delayed for a few minutes while he changed the tow rope to the other end. Soon after this mishap we ran on to large pans broken up by pressure ridges only a few feet across and 4 or 5 feet high. These pans and ridges continued for most of the day. When we got about half a mile from the island for which we were heading it grew dark, so I walked ahead to find a way through the last belt of pressure which was formed by the wind forcing the ice up against the islands. We were all safely on dry land once more and were pitching our tents by 5 o'clock in the evening.

Our troubles are now over, as we are only twelve miles from the Base, and even if we are kept here by bad weather, there are many tracks and droppings on the island which indicate a plentiful supply of seals for man and dog food.

June 27th.—We were up by 6 o'clock and made an early start. The day was perfect, with a temperature of 35° of frost. A look from the top of the island showed us that we were camped on the most easterly one of a group of about six small islands spread out along the southern shore of Red Rock Ridge; and about a quarter of a mile from it. The sea-ice outside the islands was very rough and broken, but the more sheltered strip between the islands and the coastal glacier face was only slightly cracked. As we sledged on towards the point the cracks gave place to low pressure ridges, but nothing to make our progress difficult. Off the

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point itself there was new, glare ice which was bearing well—in fact, it looked so solid that we did not bother to test it. We were soon round the point and heading for home. The ice off the mouth of the Neny Fjord was rough and tumbled about, but not nearly as bad as that which we had come over yesterday and the day before.

On approaching the Base we were relieved to see that our flying-ground had remained unbroken, as it was sheltered by several reefs on which large bergs had grounded. We arrived home at 3.30, having completed the journey of 40 miles from Terra Firma in three days, which, considering the state of the ice, was good going.

Fleming, Meiklejohn and Moore were extremely glad to see us back, for they had been very worried ever since the blizzard on the 17th and 18th. They told us that when the drifting snow stopped on the morning of the 18th they immediately climbed to the top of the island and were startled to see that all the ice to the south of them, except the small coastal strip which was held in by the grounded bergs, had blown out to sea. With field-glasses they could make out open water extending right past Red Rock Ridge. Then the second gale on the 22nd blew all the ice back again, and left it in the state which I have described. In fact, it seems that if we had been camping about 5 miles further north on the night the ice broke up, there would be little chance of our being alive now. However, that is all a thing of the past, and has slipped back in our memories as a useful experience for travelling in the future.

The dogs have had a big feed of seal meat, and are curled up contentedly in their usual family groups. We also have had a large meal, and are looking forward, with pleasant anticipation, to a day of complete mental and physical rest. This power of looking forward to things is, to my mind, the greatest gulf between us and our dogs. When one is living among them, and working with them as constantly as we are, it is obvious that they can reason and think out their own problems, but they can never enjoy a sense of pleasant anticipation.

CHAPTER SIX

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THE experiences on this dépôt journey had clearly shown that we could not go south again until the ice had withstood at least one really strong gale, and also that we should have to wait until the snow had partially levelled out the worst of the rough ice. We had negotiated it successfully with light sledges; it would be a very different business to try to get south at present with heavily loaded ones. But although the ice to the south had broken up so completely, that to the north of the Base had not shown any sign of going out. So while we were waiting to start our main journeys we decided to do the northern survey, which we had previously planned should be carried out by Stephenson and Fleming while they were waiting for Bingham and me to return from our western journey. This northern survey would be a most interesting piece of work, as we should verify our previous aerial survey and also explore the complicated fjord system which lies to the north-east of Marguerite Bay. To carry out this survey we decided to work in two parties. Bertram and I with our two teams would make up one party and travel up Laubeuf Fjord, which lies between Adelaide Island and the mainland, while the other party, consisting of Stephenson, Fleming and Riley, each with a team, would try to cover all the country from the Base up to where Bertram and I would begin our work at the south end of Laubeuf Fjord. Each party expected to sledge about 200 miles, and to be away three weeks. But there was no point in starting for a few weeks, as we could get very little surveying done until there was a longer period of daylight.

Two days after we returned we had our overdue mid-winter party and finished the last few bottles of Riley's champagne. We then settled down once more to normal life at the Base. There were several jobs on

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hand, particularly the strengthening of our sledges. To deal with them properly we decided to back up both ends, from the end of the upturn to well past the first upright, with $\frac{1}{2}$ -inch ash. This, combined with the alterations we had made at the Argentine Islands, brought the sledges well up to the standard required, and we had no further trouble with them. To achieve this Hampton took charge of the woodwork, and when this was finished Bingham and I did the lashing.

Besides working on the sledges we took our dog teams out for exercise as often as the weather would permit, and managed to find one or two seals which had come out on the ice. These, though not providing enough meat to be of much use to the dogs, made a welcome change in our own diet.

The days gradually lengthened, and we thought that by July 20th, though we should not yet be seeing the sun above the hills, there would be enough light for us to start. The last few days at the Base were, as usual, spent in collecting sledging gear and putting the finishing touches to the dog harnesses and traces.

July 20th.—A bright, calm day with a slight ground fog. We got away from the Base at 10.30. Bertram and I are travelling with Stephenson's party today, but tomorrow we will push on, while Stephenson begins his survey. I have a new addition to my team, a dejected-looking, undersized little dog which is really a brother to my other four pups. As he is generally being bullied by them and pushed out in the cold, we have christened him Orphan.

The surface was good, about 4 inches of soft snow on top of a hard crust, and the dogs trotted along well in spite of their loads. I have one of our ordinary broad runner sledges, but Bertram is using a rigid narrow runner, one which we have taken to save the others, for since we had to abandon two with the tractor and depôt we may be short later on. Moreover, it will be interesting to try it out on a journey long enough to give us plenty of different surfaces.

By 2.30 we had covered 11.5 miles, and after crossing the mouth of Calmette Bay were just off the point between it and Square Bay. There

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was a fresh wind blowing, making a low drift, and the next land where we could camp was another 7 miles further on, so we decided to stop where we were as we had no wish to run risks by camping unnecessarily on exposed sea-ice. Stephenson's party arrived soon after us, and we pitched our tents in a sheltered bay, backed by great rock-cliffs rising to the mountain-tops 2000 feet above us.

July 21st.—The morning was warm and overcast, with 14° of frost, but the day gradually cleared and there were 42° of frost when we camped this afternoon. Stephenson came with us for the first 6 miles, but then turned off to survey on Lagotellerie Island, while Bertram and I continued on our way. Several times while crossing Square Bay our dogs got excited and tried to run out to one side or the other as though they scented something on the ice, and before we had gone far, Crow, my leader, found a seal's breathing-hole. It was a small hole, only about the size of a saucer, and practically covered with snow. About this time of the year the seals should be enlarging them and then crawling out to lie on the ice, and as there are so many holes about we are hoping that we may meet a seal and be able to give our dogs some fresh meat again.

About 1 o'clock we entered a large bay on the west side of Horseshoe Island. It was a good place to camp, but there were still some hours of daylight left, and we hoped to get further on. I climbed up to the top of the ridge which forms the north side of the bay and got a good view ahead. A few miles further on I could see a pleasant little cove with low, sloping banks which looked as though they should have good camp sites on them. I returned to Bertram, who was looking after the dogs, and we decided to go on and camp there. Most of the snow was blown off the island, leaving great exposed boulders which would soon smash up the sledges if we tried to go straight across, so we drove round on the sea-ice and reached the cove at 2.30, having done 10.8 miles.

The big bay which we first visited looks as though it would make an excellent emergency harbour for the *Penola*, and we shall sound it out with the *Stella* next summer.

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July 22nd.—Blowing a moderate gale and snowing this morning. The next possible place to camp on land is a large, long island lying north and south, with a razor back of exposed rock 1500 feet high running down its centre. The southern end is about 2 miles wide and, as we have the correct bearing, we should be able to find it in almost any weather. So, after waiting for a little while to see whether the wind was going to increase and finding that it did not, we left camp at 10.15, and followed the coast of the island we had camped on to its northern end, from which we headed straight out across the fjord. Once clear of the land the wind was much stronger, blowing the drifting and falling snow directly into our faces, and making the dogs unwilling to go forward. My little dog Orphan got very discouraged and lay down several times. He had never before been expected to do anything in a blizzard, and could not understand why he was not allowed to curl up into a warm furry ball and go to sleep until it was all over.

When we had covered about 5 miles the wind began to slacken, and we could just distinguish the outline of the island ahead showing up as a vague dark mass through the falling snow. The weather gradually cleared as we approached it and the wind died away. Soon after the weather improved we saw a seal lying out just off the ice-cliff which forms the south end of the island. The time was only half-past twelve, but as we had already covered 7.5 miles and our dogs were needing fresh food, after the winter spent on such a low meat ration, we decided to camp at the nearest possible place and then go out and collect the seal. Just beside the ice-cliff there was a possible-looking place to put up the tent, on a raised shingle beach bordering the south-west corner of the island, so we drove over to it and unlashed. We found the beach was quite a good camp site, but we had to stay close to the tide-crack, as the ground further back was strewn with rocks which had fallen from the steep mountain-side. And if there were a north wind bringing a sudden rise in temperature more would be likely to fall, endangering the tent and dogs if we camped within their range. After unlashing and piling up our camping gear, we drove out to kill the seal. On

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the way we saw four more scattered about on the ice about a quarter of a mile apart. We killed them all and cached them near our camp to be picked up later on.

July 23rd.—It has been snowing and blowing a gale from the north all night. At the usual getting-up time next morning it was as bad as ever, so we stayed in bed until about 10 o'clock, when the weather began to improve. By 11 o'clock travelling was quite possible, but as it was so late in the day we decided to spend it sealing. By going to hunt seals in the direction of our next day's travel we should make a useful trail through the snow, which was lying in big, soft drifts in the lee of the island. Soon after we got out of the tent to start harnessing the dogs, Bertram saw a seal lying only a few hundred yards away, so while he cut up the dogs' evening meal I went out to kill it, and was surprised to find that it was using the breathing-hole at which we had killed a seal the day before. This was remarkable, for when we cut up a seal we usually push the entrails back into the water, as they are full of parasites which might easily affect the dogs if we were careless enough to let them get at the offal. This seal did not seem in the least worried, and was peacefully sleeping on the blood-stained snow.

After killing it and hauling it to the cache, we drove off northwards towards the narrow channel which Stephenson had seen from the air, separating Pourquoi Pas Island from the mainland.

After travelling for some 3 miles we picked up another seal, and then started back to camp. When we had gone about half-way the wind suddenly got up and blew from the south, accompanied by falling snow. Bertram was driving his empty sledge in front while my team was towing the seal behind, and as the wind increased he soon disappeared into the drift. In a few minutes the wind was really strong. Our fresh track, which had only been made a few hours before, had not yet had time to harden and was completely blown out. My leading dog soon lost his way and began to wander, so I turned to the left and headed the team for the tide-crack along the shore of Ridge Island, which was

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about half a mile away. When we reached it I turned the dogs to the south, knowing that I could follow it down to our camp. The drifting snow was so thick that although the dark rock-cliffs of the island were only a few yards away they were quite invisible, and I was afraid I might drive past the tent without seeing it. Bertram, who had reached camp with his light sledge before the trail was obliterated, had foreseen this difficulty, so left his team just below the camp on the tide-crack where he knew I would find it.

We soon had the dogs fed and comfortable for the night, and were back in the tent enjoying a supper of fresh seal liver.

July 24th.—The wind has swung round and is blowing the usual gale from the north-east. We spent a comfortable lazy day in the tent, reading and listening to the wind roaring down the fjord outside.

July 25th.—We woke to find a beautiful, calm, clear day with a temperature of 44° of frost, and we were under way by 10.30.

The morning was spent in travelling up Bourgeois Fjord, and we reached The Narrows just before midday. The ice looked thin but quite passable, and we got through without any difficulty. Soon after passing The Narrows we saw the sunshine on the snow ahead. We could not see the sun itself, for it was cut off from us by a large mountain-peak on the mainland, and judging by the formation of the country it looked as if it would soon dip behind the low passes. We shouted to our dogs and hurried them on to try to get a glimpse of the sun, which we had not seen for over three months. We soon got level with the small branch fjord down which it was shining, and saw the great golden disc just as its lower rim was beginning to slide behind one of the jagged mountain-sides. The warmth of the sunlight after its long absence was wonderful, and filled us with a feeling of great joy. We had not realized during the winter how much we had missed the sun until we felt its warmth again and saw the sparkle on the snow. This happiness at seeing the sun's return was much more marked after the second winter; in fact, I do not remember any particular impression being made on me when it returned to the Argentine Islands.

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By 2.30 we had covered 13 miles, and were off the mouth of a wide bay which was bordered by a shingled beach along its eastern side. We decided to camp, as we thought that the next place where we could get on land would be the islands about 12 miles away, where we hoped to start our survey. An east wind was raising a low drift as we put the tent up. I was 'outside man,' so had the pleasant experience of coming in from a cold biting wind to a warm comfortable tent with everything neatly arranged and our afternoon cocoa simmering on the stove. During these winter sledge journeys we wished to make the best use of the small amount of daylight for travelling, so we cut out the usual midday lunch halt and had either tea or cocoa with a biscuit as soon as we were both in the tent, and then our pemmican dinner later just before going to bed.

July 26th.—We got away at 9.30 this morning, but did not do a particularly good day's travelling as we soon met deep, soft snow lying in Bigourdan Fjord, which runs east and west and so collects the snow blown into it by the prevailing northerly wind. However, we got round the corner into Laubeuf Fjord and camped on the group of low, rocky islands about 50 feet high, where we proposed to start our survey. We are now 55 miles from the Base, and at the point which Stephenson's party hopes to make the northern limit of their survey.

Just before camping we passed four seals lying near the islands. Bertram killed one and dragged it into camp, so we were able to give the dogs another feed of fresh meat.

July 27th.—The mountain-tops were showing above a low ground fog when we started this morning, but it soon cleared off, and we had an excellent view of the country for our first day's survey. The fjord up which we are travelling is fairly wide at this end—about 20 miles—but it soon narrows and is divided by three narrow islands with exposed rocky outcrops much like Ridge Island. We are going north up the eastern channel and coming home down the western one. Today, after travelling for 15 miles, we camped in a sheltered bay just short of the north point of the first island. We were forced to camp on the bay-ice

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as the sides of the channel are fringed with the usual ice-cliff. However, the snow is lying several feet deep and is therefore dry on top.

July 28th.—The usual northerly wind was blowing this morning, raising a drift, but we could just see enough to get the necessary bearings for our map. Soon after we started the wind slackened until there was a steady drift only about 2 feet high.

This channel is a weird-looking place—it is only about 5 miles wide, with ice-cliffs 60 or 70 feet high fringing it on both sides. Above the cliffs on the west side the steep island rises to about 1500 feet, while on the east side magnificent pinnacle-like mountain-peaks rise to 6000 feet. These peaks are divided by great ice-filled valleys coming down to the coast; the ice in many places spills over precipitous cliffs in chaotic ice-falls, while the mountain-sides themselves are covered with hanging glaciers. These, in the pale winter sunlight, glow with wonderful shades of blue and green in striking contrast with the dark massive rock-faces between them.

By 3 o'clock we had covered 7 miles, and were near the narrows which had worried Hampton while he was flying down from the Argentine Islands with Stephenson during the summer. The wind was strengthening again, and as a narrow channel like the one ahead, which is certain to have a strong current running through it, is the sort of place where one would expect to find thin ice, we sledged over to the shelter of the ice-cliff of the second island. Then Bertram stayed with the dogs while I went ahead on skis to examine the conditions in the narrows. After ski-ing for about a mile I was able to climb up to a low ice-tongue running out from the north end of the island, and from here I got a good view over the beginning of the narrows. They were very much narrower than we expected from Stephenson's description. All the ice that I could see showed ominous grey patches. By now the wind had strengthened to gale force, so I returned to the sledges, and Bertram and I decided to camp where we were and not to venture out on this thin ice so late in the day and while such a strong wind was blowing.

July 29th.—The north wind blew all night but died down early this

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morning, and we were away by 9.30. We soon rounded the point of the island and got out on the thin ice. For the first $1\frac{1}{2}$ miles there were many patches of grey, wet snow, but the ice itself was bearing well. As we progressed it got thinner and thinner until at last we stopped the sledges and went ahead to prospect.

Here the channel narrows down to only 400 yards, and then splits again and continues down each side of North Island.

I went slowly forward on skis towards this narrow place, testing every foot of the way with my ice-chisel. However, the ice became too rotten even to bear me on skis, and I was forced to swing across the mouth of the west channel between Middle Island and Adelaide Island where the ice was still very thin but possible to sledge on. We set off again with the sledges and headed across the mouth of this channel towards the ice-cliffs of Adelaide Island, for we thought that we might find a possible route to the north along this shore. We were soon able to get a better view in the direction we wanted to go, and to our surprise saw a large extent of open water with various kinds of animal life about, reminding us of summer. We counted 15 seals lying out on the ice, and many more were putting their heads up out in the open water. There were also Dominican gulls, giant and snow petrels, and of course the inquisitive little Adélie penguins. One penguin followed us for about a quarter of a mile—our dogs were trotting and must have been doing at least 5 miles an hour, but this strange little creature sliding along on its stomach appeared to have no difficulty in keeping up with us; in fact, so carried away was he by his curiosity that he forgot to stop when we did and came sliding right in amongst my dogs. Before he had time even to look surprised there wasn't a feather left.

As we approached the Adelaide Island shore the ice became impossible and we were forced to turn south. We were in a good position for the turning-point of our survey as we could see up the channels on both sides of North Island and could get a good idea of the northern trend of the Adelaide Island coast. We found Stephenson's sketch-map, which he had made from the air, extremely good in all its major

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features. And as we were planning to do a further flight over Marin Darbel Bay in the summer, we were really missing little by not going on the 11 miles to Liard Island as we had originally planned.

Soon after we turned, Bertram's dogs began to overtake mine. He bore down on the brake to check them, and to his surprise found that it went right through the thin ice into the water. In fact, so thin was the ice that a large seal who wished to get a good look at us pushed his head up several times through the ice where we had cut into it with our sledge runners.

Soon the north wind, which had been kind to us while we were out on the thin ice, started to blow again, but as it was now on our backs it helped us on our way, and the dogs trotted along at a good pace. By 1.30 we were off the south end of South Island with the wind increasing. Soon the high drift blotted everything out. As we were still doing a running survey we stopped in the lee of a small berg to see whether the visibility would improve. We waited until 3.30, but the wind by this time had increased to a full gale. We could not see more than a few yards, and when we went out of the lee of the berg it became almost impossible to walk across the wind. The berg was small and well buried in old bay-ice which, judging by its smoothness, had never been broken up, and must have withstood many gales. We decided that we were quite safe where we were, and it would certainly be very much pleasanter putting the tent up here instead of out in the full force of the wind. So we camped there.

July 30th.—The wind roared all night, and when we looked out this morning we could see nothing through the falling and drifting snow. As we are in the lee of a berg there is a great deal of drift round the tent, and the sledges are buried. Towards evening the wind increased until we estimated its force at something over 100 m.p.h. Just before dark the berg began to rock and keeps hitting up against the ice edge, which causes unpleasant jars to be felt underneath the tent. We are not really worried by them, as this sort of thing must have been happening here for months without breaking up the ice. But every time there

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is a particularly heavy jar beneath the tent one has an uncomfortable feeling that after all the ice may break up this time. So mainly to satisfy our peace of mind we decided to take it in turns to watch all night, thereby making it possible for the man off watch to get a peaceful uninterrupted sleep instead of lying half awake listening and waiting for something to happen.

July 31st.—Still blowing as hard as ever, but the sky has cleared. We dug out and moved the tent a few yards today, as the weight of snow which had drifted round it was pushing it down into the slushy layer just above the hard ice. The temperature yesterday and today has been either just above or just below freezing, which means that the drifting snow thawed on our clothes when we went outside, making them very wet. The stove has been going hard this evening getting things dry again.

The berg is still rocking gently, so we have decided to keep watch again tonight.

August 1st.—The wind began to die down soon after lunch today and it is practically calm tonight. We went for a walk this evening, and at an open crack on the other side of our berg we were surprised to see seven or eight seals lying on the ice. They did not seem in the least bothered by the wind, and must have been there for some time. But what was even more surprising was that among the Weddells we saw two crabeaters. These crabeaters, according to biologists, should not have been there, as it is always supposed that they spend the winter away from the coast, living among the pack-ice. As there is so much less wind we are not bothering to keep any watch tonight.

August 2nd.—A fine day at last, with the temperature down to 26° of frost. We got away about 10 o'clock after spending some time digging out the sledges. The wind has made the surface perfect, and the dogs, pleased at being on the move once more, galloped along, covering 6 miles in the first fifty minutes.

At the first stop to untangle traces, Crow was attracted by a seal lying up-wind about a quarter of a mile away. He suddenly dashed off and was immediately followed by three of the pups. Bertram and I wen

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after them and caught two of the pups, but Crow would not come back, and as there were many seals dotted about over the ice, he, while running from one to another, gradually got further away. We spent about two hours trying to catch him, but at last he went right out of sight with the pup still following him. We returned to the sledges and decided to go on about 11 miles to the islands where we had begun surveying, and there to wait for them. As they had run off to the north-east they could not get out of the fjord without cutting our trail, and when they picked it up we felt sure they would follow it into camp.

We carried on, putting the finishing touches to our survey, and arrived at the islands about 3 o'clock. Dr. Charcot's map of the east coast of Adelaide Island we found correct up as far as Webb Island, but after that he had gone rather astray, which is only to be expected considering the distance and angle from which he saw the coast.

August 3rd.—Crow had not arrived when we got up this morning, but as we intend to spend the day here and take some star sights tonight, he still has a good chance of not being left behind. After breakfast we left the tents standing, and drove off to make a trail through the deep snow in Bigourdan Fjord. We sledged for about 6 miles until we began to meet a better surface and then turned back to camp. On the way back we killed two seals and took their livers, also enough meat to feed the dogs tonight.

All the fresh meat has made the dogs wonderfully fit, and with the short travelling days they are very lively, especially my pups, who generally take it into their heads to have a game together at about 3 o'clock in the morning. They are all tethered in front of the sledge by their traces, and when they start romping about these become more and more tangled until at last one gets a hitch round his leg. This hurts, and to give vent to his feelings he immediately attacks something, generally Orphan, who tries to run away. The old dogs get mixed up in the general confusion, and a real fight starts, which means that the driver must get out of a warm sleeping-bag and spend half an hour sorting them out. His only comfort while fiddling about with cold

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fingers is to know that when they get some hard work to do they will soon learn to keep quiet at night.

It was a clear, still evening tonight for taking our star sights. We are now 55 miles from home and should, with any luck, get back in two days.

August 4th.—A fine cold morning with a temperature of 60° of frost. Crow has not arrived, but there is still a chance that he will come home and bring the pup with him. We got an early start at 9.15 and went along well over yesterday's trail.

The fjord was full of fog, but we could just see the top of Ridge Island showing above it. As we approached the island we crossed a fresh sledge track leading to the north, so we most probably have passed close to Stephenson's party and missed them in the fog. He must be to the north of us, so we shall get home before him. We arrived at our old camp site at 4 o'clock; this leaves 31 miles to do tomorrow.

August 5th.—Another good cold day with 60° of frost. When we started we could see practically nothing through the ground fog which lay thickly in the fjord. But when we got outside Horseshoe Island we ran out of it into brilliant sunshine.

As the fjords are subject to such local winds one never knows what kind of surface to expect, and it may change completely in a few miles. The surface across the mouth of Square Bay was heavy, slowing the dogs down to a walk, but once we got across to Camp Point we met a better surface, though it was still fairly soft. Darkness fell as we reached Cape Calmette; we could just see the cliff of the glacier which runs past the Debenhams, so we followed this down until we sighted the islands themselves, showing up vaguely through the darkness. The dogs did not seem to realize that they were getting home until they were about a mile away, then we finished with the usual burst of speed, arriving outside the house at 8 o'clock. Everyone was having dinner, but it did not take them long to get on their windproofs and come outside to help us unleash our sledges and tether the dogs.

Stephenson's party got back three days after Bertram and me, and the following chapter gives his own account of their journey.

CHAPTER SEVEN

NORTHERN SURVEY JOURNEY

By A. Stephenson

SINCE our arrival at the Debenham Islands we had found time to do a certain amount of local survey, which by mid-winter extended from Nený Island in the south to the far side of Calmette Bay in the north. It was from this latter position, known as Camp Point, that we hoped to start surveying on this journey, and we hoped to cover in a general way the region of Bourgeois and Bigourdan Fjords. I had seen these fjords from the air and knew approximately what to expect.

The entrance to Bourgeois Fjord lies between Camp Point in the south and the southern end of Pourquoi Pas Island in the north. Mid-way in the entrance lies the island of Lagotellerie. The main arm of the fjord runs in a north-easterly direction, and is bounded by Pourquoi Pas Island on the north-west, with Horseshoe and Ridge Island on the south-east side. Immediately east of Horseshoe Island is a rectangular-shaped bay known as Square Bay in which lie Broken Island and Centre Island. Some 10 miles north of Ridge Island the fjord comes to an end, but immediately opposite the northern tip of Ridge Island there is a narrow channel connecting Bourgeois Fjord and Bigourdan Fjord. The latter runs due west into Laubeuf Fjord, where Rymill and Bertram were going to start their survey.

When we left Camp Point on July 20th we made for Lagotellerie Island, and after a short time Rymill and Bertram left us, heading for Horseshoe Island. On reaching Lagotellerie, Riley and I prepared to set up a survey station, whilst Fleming went off to collect and examine rocks. Since most of the work on this journey was survey and geology, it would be as well if I described the usual methods used.

Whenever possible we had our camps in some central position whence we could do two or three days' work without changing camp. This

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meant that in going to and from survey stations we travelled with light sledges, and with as many clothes on as possible, for it was the coldest month. We had only two teams between the three of us, and Riley and I usually shared my sledge, which left Fleming free to go where he liked, for he seldom wanted to stay in one place as long as we did. On approaching the place where we wanted to stop, we would take it in turns to get off the sledge and run or ski in order to get warmed up for the long period of standing still. Having halted the dogs in a sheltered place, I then chose a position for the theodolite from which I could get the best view of the surrounding country. Before I could begin any sketching or theodolite work, however, a change of gloves was necessary. For normal travelling and work with sledges I usually wore mitts, either horse-hide or seal-skin, but these were far too cumbersome for instrumental work, and I changed into silk-fingered gloves, on top of which I wore loose-fitting chamois-leather gloves which I had had specially made. With these on, I could do almost anything I could do with bare fingers and, providing I was warm when I began, I could keep my fingers 'alive' for some time. With temperatures of 50° to 60° of frost, however, after standing still for ten minutes I found it necessary to run round to get my circulation going again.

Dressed for the occasion, and properly warmed up, one is ready to begin, but it is a different beginning from that usually adopted at a theodolite station. Generally speaking, one writes down in the angle book the names of the landmarks and prominent features to which one wishes to observe angles. If the features are unnamed, then descriptive names are given such as Black Cape, Silver Peak or Rugged Promontory. There is a limit, however, to such descriptions, and one soon comes to the end of one's resources, especially when at least half a dozen peaks fit one description. Frequently on looking around at a survey station there would be at least forty points to which I wished to refer, and on more than one occasion they exceeded fifty. Obviously it was impossible to describe all these points, so the only solution was to make a panoramic sketch of the country and to number the respective features.

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Such a procedure was rather lengthy, and it also meant that I had to do it myself, rather than just call out the names whilst Riley, or whoever was booking, wrote them down. Once the sketching was done I would go for a run to get thoroughly warmed up again before starting the actual theodolite work. Generally speaking, using the theodolite was not such a cold job, as one was continually moving from side to side, and one could wave one's arms about to keep warm. Writing down angles in the angle book was a far colder job, and both booker and observer were very glad when the last reading was made and we could enjoy a long run with the feeling that we had finished.

On this particular day Fleming got back just as we had finished, and we returned to Camp Point together. By the time we had packed up and disentangled the dogs it was getting dusk and felt much colder, although as yet the sun had not reappeared and there was little diurnal variation in the temperature. The dogs had a trail to follow on the way back, and we rode and ran alternately, partly to keep warm, and partly to get home more quickly.

It was a comforting feeling to know that the tents were already pitched, and our beds and everything unpacked. To go home to a camp already made, after a period of pitching one's camp daily, is like going to a house in civilization, hanging up one's hat and coat on the peg, and sitting down to a meal. The car of course had to be garaged, or, in our particular case, we had to unharness the dogs and tie them to the sledge, but this was a procedure which quickened with practice, until the dogs almost tied themselves up.

From Camp Point we went north to Horseshoe Island and hoped to find a sheltered camp site on the islands in the big bay on the west side. We spent some time walking all over the islands looking for a place sheltered from the northerly winds, and at last we found one which was exposed on the south-west side only. However, the moment we began to unleash our sledges a howling wind sprang up from the south-west, bringing with it a driving wet snow which caused everything to be drifted up in no time. In my diary I wrote: "The wind lasted the

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whole of the time we were pitching camp, with the result that I had to spend a long time taking one article into the tent at a time, brushing all the drift off and out of it, and putting it on the groundsheet, which I had turned half-way back. Having got everything in, I then took off my snowy clothes and, depositing myself on the dry half of the groundsheet, proceeded to set my house in order. It is rather nice having a tent all to oneself with plenty of room and everything inside—ice, paraffin, food-box and tent-box. The house being arranged and all the loose snow removed, I lit the stove and made myself a very welcome cup of tea. We shall probably be camping here for two or three days, as it is the centre of a completely new area, and a very good point from which to work. At the present moment I cannot see much more than 10 yards—but that is by the way.”

This was on July 22nd; on the 23rd I wrote: “At 10 o’clock last night it was cloudless and a beautifully calm night. When it changed I know not, but from 6 a.m. I spent the time dozing, then waking and listening to the blowing and drifting, then turning over and dozing again. I continued thus until 12, when I at last decided to have some breakfast.” The longer one can put off breakfast when lying up the better, for either it means saving a meal altogether or, what is preferable, having one’s meals at three-hourly intervals instead of six. The latter breaks the monotony of the day very effectively.

There was no survey done that day, but on Friday, July 24th, things improved, and although there was a low ground drift it was clear above, and the thermometer recorded 42° of frost. Fleming went off to the south to geologize, whilst Riley and I went in behind our small islands to the back of the bay. My intention was to climb up to the top of one of the small peaks on the north side of the island so that I could get a good view to the north, looking up the east side of Bourgeois Fjord, and at the same time still see the main points we had fixed to the south of us. We sledged to the edge of the glacier, but as it was still early and the dogs were quite fresh after their day’s rest I dared not leave them alone whilst we were occupied some miles away from them, so Riley

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drove them back to camp, arranging to come again for me some hours later.

I climbed up a gently sloping glacier to a broad valley between two peaks, and was surprised to find two or three shallow fresh-water lakes, with glare-ice surfaces, which occur when all traces of snow have been blown away. It was pleasant to see fresh-water lakes again, even in this frozen state. The ice was a deep black, but here and there divided up by thin wavy white curtains which seemed to go straight to the bottom. The veins of white formed by air bubbles in the vertical joint planes in the ice made the most picturesque patterns, and I was very sorry when my walk over the ice came to an end. Once across the lakes the going was not so good, and I had to scramble up hill-sides covered with loose boulders. This type of country is easy enough when you can see the boulders and can step from one to another, but when the hill-side is covered in snow there is always the possibility of your stepping on the snow between boulders, and you suddenly find yourself floundering up to your waist in soft snow and your leg jammed between two rocks. However, when I reached the top I considered it was worth the trouble, as I got an excellent view of the country all round, and also saw what I thought would be a suitable place for our next camp, in a bay on the north side of the island.

Having finished my survey I returned down the hill and found that Riley was already back and was thoroughly enjoying himself, sliding about on the lakes. That night we did some star observations, and the following day, whilst Riley and I surveyed from the north-west point of the island, Fleming went across to Pourquoi Pas Island to look at the rocks.

The morning of July 26th was fine and cold, and we decided to move on, in spite of what appeared to be clouds of drifting snow in the main fjord. Fortunately this 'drift' turned out to be fog and we were able to proceed on our way round to the north side of the island. It was only about 8 miles, but it took us a long while as the surface was of that annoying type in which there is a thin icy crust on top, and underneath,

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6 to 8 inches of soft snow. When we got round to the north side we sledged on to the island, and then climbed along its sloping shores until we found a sheltered spot behind a rock bluff. Immediately in front of us was a steep drop of about 10 feet on to the sea-ice, but on either side it sloped down more gently. From the doors of our tents we had a fine view looking up the eastern half of Bourgeois Fjord, between Ridge Island and the mainland. I stayed up to get the 11 p.m. time signal that night, and was just going to bed about 12, when I heard a scuffle amongst the dogs, some short sharp barks, and sounds of a sledge being dragged over the ground. By the time I had undone the tent door and looked out, sledge and dogs were over the cliff edge and racing out over the fjord to a seal which had suddenly decided to climb out of its hole on to the surface. Fleming, whose team it was, went out to bring them back, but it was no easy task to drive dogs away from fresh meat when they had not seen any for some time. He eventually got them back to the island, and tied the more boisterous members of the team to the sledge itself, instead of leaving them on a long trace. This, however, was not sufficient, and next morning when we woke, there were still two dogs worrying the seal. Unfortunately one of the dogs was Nanok, a large timid beast, who, once he was free, objected very strongly to being caught again. He had broken loose from captivity a number of times since the beginning of the expedition, and it had always needed patience and ingenuity to retrieve him. A loose dog is a nuisance in that the dogs who are tied up object to seeing another dog enjoying his freedom, so we did our best to catch him straight away, but were not in the least surprised when we failed. It was a stormy and windy day, unsuitable for surveying, so we killed the seal and gave the dogs a good feed there and then, in order that they would have nearly twenty-four hours in which to digest it before working again.

The rest of that day I spent attending to the time-signal set, which had not been behaving well. The only thing to do was to take it into the tent, and if much moisture condensed in it, to keep it in the tent until it was thoroughly dry again. I found quite a lot of ice on the con-

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denser plates. This must have formed as a result of the big changes of temperature we had experienced during the previous two weeks, but after being thoroughly dried out it worked very well.

On Tuesday, 28th, we went round to the east side of Horseshoe Island, and as Riley and I went ahead we saw that Nanok, who was still free, was running in his usual place in Fleming's team, though not attached to the sledge. We stopped our sledge at a convenient time and signalled to Fleming to drive right up to us, hoping that Nanok would forget he was free and just stop automatically with the rest of the team. The scheme worked very well, and as soon as Fleming shouted "Ah!" and the team came to rest, Riley pounced on Nanok before he had a chance to remember that he was not in harness. It gives one a great sense of satisfaction to have a dog like that tied up again, for it is very annoying to travel along in soft going, urging your dogs on at every step, whilst a fine big dog is all the time running along behind doing absolutely nothing.

We returned early in the afternoon and did some work from the camp site, and then turned in hoping to continue the work by going to the south end of Ridge Island the following day. But on the next day, Wednesday, July 29th, I wrote: "It blew hard from the north all night and continued to do so today. It was about freezing-point, and I went out and walked about for two hours. The clouds were a wonderful sight, very turbulent in form and racing away to the south. I could see nothing to the north owing to the drift, but I expect there was a little hell raging up there, as steep narrow fjords come into the head of this one from all sides. It is quite bright outside tonight with the moon, and we are well up on the land, but no matter how safe you know you are, the continued drumming of the wind is worrying, and you just long for a few minutes' silence in which to go off to sleep.

"*Thursday, July 30th.*—It blew all night and most of the morning, since when it has been very warm, 32° F., and has been snowing in heavy wet flakes. At the moment it sounds as if it is raining—not very hopeful for tomorrow.

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"Friday, July 31st.—A windy night and morning. From 12 till 4 it snowed hard, then from 4 till 7 it blew and drifted from the south-west, with a drop in temperature to 6° of frost, and now it is foggy. Not very promising for August bank holiday!"

Saturday was fine but foggy, and while Fleming went east, Riley and I went north to the southern end of Ridge Island. Fog was thick all the way there, and we had to steer on the occasional glimpses of land which we saw ahead. As it was, the weather was no good for survey but we went on with the hope that it would clear when we got there and failing that, at any rate we should have made a trail for the next day. We were lucky, however, and as we approached the island the fog dispersed and we had the pleasure of some sunlight shining on us, for during the past few days the sun had climbed up above the hills, and for the first time since the beginning of May we received an appreciable amount of warmth from it. When the surveying was finished, we went on for a further 3 miles up the west coast of Ridge Island, making a trail for the next day. On our way home the fog came down again, but it was only a ground fog, and on getting back to the camp I was able to do an azimuth and longitude star observation.

We had not completed the survey of Square Bay when we left Horse-shoe Island, but we decided to push on further north and spend another day there on the way back if we still had time. It was cloudy on the morning of August 2nd and rather muggy, but as we went north the sky cleared and the temperature fell, and by the time we reached our new site at the north end of Ridge Island it was a glorious starlight night, with a full moon making it appear almost as bright as day.

Ridge Island consists of a single steep-sided ridge about 2500 feet high for most of its length, but towards its northern end it drops to a col, and then rises again to a single round hill about 1000 feet high, which falls away steeply on its northern side. To the south side of the hill and below the col was a bay, around which was a broad gently sloping beach, where we pitched our camp.

The next day, August 3rd, Riley and I decided to climb the hill

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behind the camp, whilst Fleming went off to explore the northern extremities of the fjord. It was an ideal day for a walk, clear cloudless sky with the thermometer registering 54° of frost. The sun was shining brilliantly on the top of the hill, and we walked and climbed fast to get into the sunlight as soon as possible. As we climbed the temperature rose, and when we reached the top it was only zero, a rise of 22° in 1000 feet. Such an inversion was not at all uncommon, and we noticed it every time we flew during the winter months. During a calm period, in the sheltered regions of the fjord the air becomes almost motionless, and that portion of it nearest to the ice, namely at ground-level, becomes much colder than the rest, with the result that as one climbs and leaves the ice below, the air becomes warmer instead of colder as is usually the case. Even at the Base the screen temperature which was taken on the 50-foot hill behind the house was often 5° warmer than that recorded by the thermometer just outside the house.

From the top of the hill we had a wonderful view, especially to the west, where we looked over the narrow straits into Bigourdan Fjord, and beyond that we could see Laubeuf Fjord with Adelaide Island rising up in the background. We did a very full round of theodolite angles and returned to camp in time for a cup of tea, before starting a series of star observations. Meanwhile Fleming had had a very good trip, and had been right into the north-east corner of Bourgeois Fjord, making quite certain that there was no outlet in that direction.

Doing a series of star observations on a fine cold night was quite pleasant, provided there was no wind, and also that one was working on good firm ice or ground, so that one could indulge in a brisk run every now and again to keep warm.

In high latitudes in the Southern hemisphere constellations are not so varied as in the Northern hemisphere. The Southern Cross itself I found disappointing, and there is nothing comparable with the Pole Star of the North. However, what they lack in variety they make up for in size and brilliancy. Soon after sunset one can pick out Sirius, the brightest star in the heavens, closely followed by Canopus, the second

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brightest. Canopus is not only a very bright star, but one of the tremendous constellation of Argonis, which at this time of the year passed overhead and filled a large portion of the sky. Besides these, there was the magnificent group of Scorpio with Antares, shining like a ruby in contrast with the dazzling yellow of the two pointers of Centaurus. Jupiter and Mars were also at a convenient altitude in the early evening, and I was usually able to complete my longitude and azimuth observations before Fleming got back to camp. We then fed the dogs and had tea, and wrote up our notes until it was time to go out and do a latitude observation.

I generally set up the theodolite as close to the tent as possible, so that the person who was booking for me could stay inside and write down the time and various figures in comfort. Riley did this, whilst Fleming came out and held the torch for me and shone it on the instrument when necessary. It was a cold job at this time of the night, and both of us had to do a considerable amount of running about to keep as warm as possible. Unfortunately, if you take too much exercise, you are so short of breath by the time you come to observe that inadvertently you open your mouth and breathe all over the instrument, and a film of ice forms over the eye-pieces of the various telescopes so that you can see nothing at all through them. This is very annoying if you have only a few minutes left before the star is due to transit, and you have to find a handkerchief—not always ready to hand in this part of the world—and a pencil or some other fine point, and scrape away the film of ice which has formed in most inaccessible places.

The observation being made, I would get into the tent again if it were not yet 8 p.m. and remain fully dressed until about 7.45, when I would go out to get a time signal. Accurate Greenwich Time is essential in determining one's longitude, and I endeavoured to get a time signal in the morning and evening of the day on which I was observing. The short-wave signal from Washington came through very well at 5, 8 and 11 p.m. local time. In the morning at 10 I had to get one from Buenos Aires. The time-signal set was packed up in a ration box, covered with

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canvas, and always kept outside the tent to prevent condensation inside the set. Our aerial was 60 feet long and was suspended between two skis, so that the general height above the ground was about 4 feet. At about 7.45 I would go out, uncover the set and connect up the aerial. I could not afford to leave it uncovered and connected up whilst we were inside the tent, in case a stray dog came along and damaged it. By putting the headphones on, and then pulling my parka hood over the top of them, I could listen quite comfortably and hear quite clearly without getting my ears at all cold. After getting the signal I would often twist the dial round to see whether I could hear any broadcasting, as it was very pleasant to listen to a different voice when you have only had eight very familiar voices to listen to for a very long time. However, this pastime was necessarily limited, first by the cold and secondly by the battery, which had to be conserved as much as possible.

On such nights when we turned in, having got a good round of theodolite angles, a complete set of astronomical observations and two time signals, we felt that the day had been well spent, and it would not matter whether it blew and snowed all the next day.

It (Tuesday, August 4th) turned out to be a glorious day, however, and we all three sledged across the strait and surveyed the narrows which led through into Bigourdan Fjord. Hampton and I had discovered these straits in March when we flew north, and it was just to the west of them that Rymill and Bertram had begun their survey. Pourquoi Pas Island, which for the greater part is high and glaciated, terminates in the north in a low shore-line, in places glaciated and in places forming rocky hills or even shingle beaches. Opposite this shore, coming down from the north, there is a long promontory ending in a glaciated point which comes within half a mile of Pourquoi Pas Island, thus forming the narrowest part of the strait. The strait twists round to the north and leads into the bay rather than fjord which Charcot had seen from the Léonie Islands and called Bigourdan Fjord. The straits themselves are too small and twisted to have been seen by Charcot, but in the north-east corner there is a big glacier-filled valley

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which from a distance might well look like the continuation of the fjord, and it must have been this valley which led Charcot to suppose that Bigourdan Fjord joined up with Lallemand Fjord. The valley certainly goes through from one to the other, for it was the one up which Hampton and I flew in March.

From the west end of the straits we were able to take observations to points which we had observed from the Léonie Islands in February, when the *Penola* was anchored there. We thus fixed the entrance to Bigourdan Fjord, and finished our survey where Rymill and Bertram had begun theirs.

We raced back to camp that night as it was a wonderful surface and the dogs were full of life. On reaching it the dogs went straight to their accustomed place, and I was about to unharness them when I discovered that my field notebook containing all the sketches and compass bearings for the whole journey was not in the pocket of my parka. I optimistically looked round the camp site hoping it had only just fallen out, although I was almost certain when I had lost it, for on the way home, when jumping off the sledge to run for a bit, I had fallen heavily on my back, and I was fairly certain that the book must have fallen out of my pocket then. This was some way back, but the only thing to do was to return straight away. Fleming, who had followed us, said that he had seen something lying in the trail, but had assumed it was a piece of cardboard out of a chocolate tin. I called to the dogs to get up again, but a mere shout was no good on such an occasion. When they got back to camp after a fast run they naturally thought the day's work was done, and nothing on earth would convince them that they had to go back. I took Nigger, my leader, and dragged him out on to the trail, but he merely thought I was trying to be funny and went straight back to his sleeping-place. It was quite a long way to walk, and sorry as I was to make the dogs go out again, I did not see the sense of walking when I had a complete dog team to take me. So with the aid of a little tender brutality I got them on to the trail, and very begrudgingly they went out into the fjord. Once away from the camp they became better

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tempered and went along quite fast. I found the notebook fairly easily, but the dogs, who seemed to have realized the object of the mission by now, decided they were in a hurry to return, and I had only just time to pick up the book and fall on the sledge again, for in the meantime the dogs had turned and were racing back to camp. We returned in fine form with the dogs looking very pleased with life, as if they had thoroughly enjoyed the whole trip and nothing on earth could have given them greater pleasure than to have gone back for my notebook. It was the same team which a year before had broken loose from my sledge one morning and had run all the way back to the camp site of the previous day. When Rymill and I arrived with his team, mine had come running up with their tails wagging, very pleased to see us, and quite puzzled as to why I was annoyed with them. It is useless to punish a dog some time after he has done anything wrong, and it is almost impossible when they are so pleasant about it. They must either have a strong sense of humour or else be wickedly hypocritical.

We had now been away from the Base for seventeen days, and as we had only set aside three weeks for the survey it was time we turned back, for we hoped to spend another day in Square Bay on the way home. Wednesday, August 5th, was fine, and we travelled back down the west side of Ridge Island to our previous camp on Horseshoe Island, and then round to the south-east corner of this island, where we found a large shingle beach on which to put up the tents.

The next day was fine and cold, with 58° of frost, and we made a fast trip into the back of Square Bay, where I was able to clear up a number of problems concerning the topography. In the south-east corner of the bay there are some tremendous glaciers fed from ice-falls which spill over the plateau walls, and which are here quite close to the fjord itself. One of these glaciers lies in a large valley running in a north and south direction, at the southern end of which is the big glacier which comes down to the sea opposite the Base. From a distance this valley seems to cut off from the mainland the whole of the country round Calmette Bay, thus making it appear to be an island. When Charcot surveyed

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this area from out at sea he marked the valley as Neny Fjord, not knowing at the time that the valley contained a glacier rising to at least 2500 feet.

On the north side of Square Bay we discovered that Broken Island, as we now call it, was not a promontory forming the southern side of a small fjord, but an island separated from the mainland by a small strait. In the back of this northern arm, which we thought was a fjord at first, was a broad, gently sloping glacier, coming straight down from the plateau, which here falls in height. This seemed to us to provide quite a feasible way up into the interior. This was about the first reasonable approach to the interior which we had seen along the whole coast, excepting for the area much further to the south, where the steep-sided plateau no longer existed.

Fleming found a great many things of interest in Square Bay too, so much so that he would have liked to stay there for another week, but our time was limited and he decided that he would have to return there when the bigger journeys were finished. He had found numerous raised beaches, and the moraines by the glaciers contained many specimens of rocks from the interior. The general aspect of the whole country was of interest too. There was a great deal of exposed rock, much more than further north, and the slopes of the scree-covered hills were extraordinarily even and quite steep. It was a very different country from the ice-covered islands around our first base.

Friday, August 7th, was cloudy, and it looked very stormy up in the mountains. Our fine spell seemed to have come to an end, and we decided to get on as far as we could before fresh snow made the going more difficult. It was quite bad enough as it was, for it took us four hours, with one man breaking trail, to do the 9 miles from our camp to Camp Point where we had camped on the first night. From here we hoped to pick up Rymill's and Bertram's trail, signs of whose return we had seen two days previously when we sledged across into Bigourdan Fjord. Soon after rounding the Point we found numerous sledge tracks, far more than two sledges could make, and we wondered what had been

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happening, for the trail was quite fresh. We discovered later that a party of four sledges had set out from the Base to collect some seals which Rymill and Bertram had killed, but on seeing signs of wind and drift in the mountains they had returned home. We followed their trail, and with all of us riding we covered the last 12 miles in three hours, arriving back at the Base just in time for the wireless news, which came through at 5 p.m. local time.

CHAPTER EIGHT

PREPARING FOR THE MAIN JOURNEYS

EVERYONE had been very busy while we were away. Hampton had finished strengthening the sledges and had the aeroplane ready for a trial flight; Bingham and Moore had trained the rest of the pups and had made all preparations for our Charcot Island journey; Meiklejohn had been working on his wireless, and had repaired the aeroplane camera, the electric parts of which had been giving trouble.

Now that we were all back, three main things remained to be done before we could start the long journeys. These were: to make a flight round the north of Alexander I Island; to get some fresh meat for the dogs; and, if possible, to locate the dépôt and tractor which we had abandoned on the sea-ice near Terra Firma.

The flight to inspect the conditions of the sea-ice off Alexander I Island was essential, for at this time we believed that it was the only possible way out of Marguerite Bay to the west. A sledging party attempting to do the journey would have to cross the mouth of the bay a long way from land, on what would probably be dangerous sea-ice, for it was continually being broken up by the wind. Even when Alexander I Island was reached, the chances of finding a landing-place for the sledges would be small, for the coast was sure to have the usual precipitous ice-cliff. While sledging at sea-level one cannot see far ahead, and one is therefore likely to try to cross a stretch of bad ice without realizing its extent, and to spend several nights camping on it. With the weather which we had been having this would be courting almost certain disaster. But in a single aeroplane flight, lasting only a few hours, the whole stretch could be flown over, and we could see whether a sledge journey to the end of the Dependencies by this route round the north end of Alexander I Island was a practical proposition or not.

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But before we made the flight we decided to take all the available teams up to our cache on Ridge Island and bring back a load of the seal meat we had left there, for there was such a marked difference between Bertram's and my dogs, which had been getting plenty of fresh meat, and the ones left at the Base, that the latter would need fattening up before they were fit to set out on a journey. Hampton, Bingham, Bertram and I made a start on the morning of August 7th, but a strong wind got up while we were crossing Calmette Bay, so we turned back, for we should have had little chance of finding the cache in the thick drifting snow.

Stephenson's party arrived at the Base on the evening of the same day. We were now all together again, so we decided that, as the season was advancing, one party should leave for the northern cache while another one started south to try to find the depôt there. Meanwhile Hampton and I would stay at the Base, so that we could take the first opportunity of making the Alexander I Island flight.

We were all held up by continuous bad weather until August 14th. Then Riley and Bertram left to bring in the seal meat, while Bingham, with his team, and Fleming driving mine, left for the southern depôt.

On the same morning there were low clouds out to the west, so Hampton and I decided not to do the long flight, but to make a trial one, for when Hampton was testing the aeroplane engine on the ground he found that it was still not giving its maximum revolutions, being about fifty a minute short. We did not think this would prove serious except that we could not get our full ceiling. However, we thought it would be wise to make a trial flight before venturing far out over the sea-ice.

We took off soon after the sledges left, with the idea of trying to find the depôt from the air. We soon covered the 34 miles to its supposed position, but although we spent some time circling round we could see no sign of it. This was not very surprising, for much snow had fallen since we had abandoned it, and it would certainly be covered up, with only the bamboo poles showing. On the way back we dropped a note

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to Bingham, who was nearing Red Rock Ridge, to tell him that we had seen nothing of the depôt. And then as the day was very pleasant we thought we would fly outside Millerand Island to see how Riley and Bertram were getting on.

As we passed outside Millerand Island, flying at about 1500 feet, we came in close up against its towering cliffs, which rise almost vertically from the sea to a height of 2000 feet, and as we passed them we were surprised to see dozens of snow-petrels flying about and alighting on the ledges. This was all the more remarkable as it was August. In the few localities where snow-petrels have been discovered nesting the eggs were never found until the end of November. We could not be certain whether they were nesting here or not, as unfortunately it was quite impossible to reach the place where the petrels were. It was nevertheless curious that they should have been very numerous in August, while later in the season when they should have been nesting very few were seen.

We soon left Millerand behind and caught up with Riley and Bertram, who were crossing Calmette Bay. The snow surface looked solid and their dogs were trotting well. We circled over them several times and then headed back to the Base. The trial flight had been satisfactory; the engine, although still not giving its maximum revolutions, was running smoothly, and Hampton passed it as fit for longer flights.

The sky the next morning—August 15th—was clear except for low clouds to the south and south-west. As was usual on a morning when there was low cloud about and we wanted to fly, Stephenson, Hampton and I made several trips up the hill behind the house to look out over Marguerite Bay to see whether the clouds were gathering or dispersing. As the morning wore on they certainly grew no worse, so we decided to start, and took off at 12 o'clock. There were 64° of frost on the ground, but as we rose into the warmer air above, the temperature went up about 20°. This cleared the frost off the windows, and we were pleased to see that the visibility promised to be good, for we could just distinguish the northern part of Alexander I Island, and it appeared to be quite free of the clouds which were covering it further south.

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As soon as we were clear of Millerand Island, Hampton headed the plane straight across the bay towards the distant mountains. On such a flight, when we were going some distance from land, we kept checking our speed and drift on a remote control drift indicator let into the cabin floor. We never had any trouble doing this, for pack-ice is nearly always broken up by pressure ridges and pressure areas which give the navigator excellent observation marks.

As we drew level with the mouth of the 'narrow fjord' in the south-west corner of Marguerite Bay, which Hampton and Stephenson had seen while flying on March 13th, we were surprised to see that it appeared to be a much larger feature than they had thought when viewing it from the turning-point of their flight. They had then been looking at it from a different angle, when it had had the appearance of being much narrower than it really was.

Although we could now see that it was a major feature of some kind we were not very much better off than they, for the clouds which had been hanging about all the morning were still obscuring the southern horizon. However, they were gradually clearing and we hoped for a better view on the way home.

When we were about 20 miles off Alexander I Island coast we were worried to see that the ice beneath us was becoming thin, and looked as if it had been recently broken up. A few miles further on we were flying above open cracks and pools, while everywhere the ice looked a dull grey colour, and was broken into pans 100 to 300 yards across. These were separated in many places by open water, or patches of ice so thin that they were only just a little lighter in colour than the dark, open pools themselves; whilst 15 to 20 miles out at sea a low heavy fog bank indicated the northern limit of the pack.

As we drew level with the east coast, we saw that Nicholas II Island, as Charcot named it, was really part of the mainland, being just a mountain massif protruding through the ice-cap which covers this part of Alexander I Island. For an observer on a ship some miles out to sea—as Dr. Charcot was—it was a very natural mistake to think it an

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island, as we saw later from the *Penola*. For when about 30 miles away, the valley separating Nicholas II Island so-called and the higher mountains could not be seen, hence the appearance of complete isolation.

We flew on, following the north coast for 50 miles, gradually gaining height until we were flying at about 6000 feet. Eventually we sighted what appeared to be Rothschild Island, which we discovered was also part of the mainland. For the whole distance round the coast the sea-ice was very thin and broken up by leads and pools, while out to sea the dense low fog continued, lying in an east to west direction. At the coast the ice-cap ended abruptly in a high cliff with a broken edge showing many icebergs in the making. Behind the cliff the ice-cap rose steeply in crevassed slopes to a height of about 3500 feet, where the exposed mountains began. These, in great massive groups, intersected by slightly crevassed glaciers, rose gradually towards the interior.

We turned for home when we were 140 miles from the Base in lat. $69^{\circ} 0'$ S. and long. $72^{\circ} 0'$ W. We had photographed all the north coast of Alexander I Island on the outward flight, so that there was not much for the observer to do on the way back until we were clear of the land and could get another look to the south, which we hoped would now be free of cloud.

As we passed the last mountain we eagerly looked towards the 'narrow fjord.' The clouds had now cleared away and we could make out what appeared to us to be a great sound running away to the south as far as we could see. Its mouth was about 60 miles from us, so we could not see whether it was filled with sea-ice or low shelf-ice, and unfortunately we had not enough petrol left to allow us to go and look. We took the necessary bearings for fixing its position roughly on the map, and then continued on our way home, wondering what this new discovery would bring forth.

The rest of the flight back across Marguerite Bay was uneventful. We kept a careful note of the course and distance as far as Millerand Island, which would help us to plot our bearings. After landing we

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soon had the plane in the hangar, and Stephenson started plotting our new channel on the chart.

From our rough aerial survey it appeared, when plotted, to run in a direction slightly east of south, and to be about 15 miles wide at its mouth.

This discovery, together with the existence of bad ice off Alexander I Island, upset all our sledging plans. Impassable ice, though not unexpected, made us abandon the idea of sledging to the end of the Dependencies by this route, while on the other hand the new channel had opened up new possibilities. We had, of course, no idea where it eventually led. It might connect with the Weddell Sea, for, as I have already said, we had been told that Ellsworth had confirmed the existence of Stefansson Strait, or it might be the entrance of a strait leading to the west behind Alexander I Island, confirming Wilkins's report that Alexander I Island was an island. By this time, judging from our own experiences in the air, and from what we had already discovered to be wrong in previous reports, we were naturally very sceptical of information brought back from hurried single flights without any kind of ground control. Yet even so, it was extremely difficult when drawing our own conclusions totally to disregard the reports of such well-known airmen as Sir Hubert Wilkins and Mr. Lincoln Ellsworth. Anyway, it was obvious that we should have to make a reconnoitring flight down the channel before we could form any plans for the future.

Next day Meiklejohn, who was cook, got up early and reported a fairly clear morning. After breakfast there was still a little low cloud about, but from the top of the island it looked clear to the south. Hampton and Stephenson decided to fly down 'the new sound' and were in the air soon after 11 o'clock. They flew direct to the entrance of the sound on a bearing of 200° true and made quite certain that there was no break in the coast-line north of it. On approaching the strait, however, visibility began to get bad and they could see nothing beyond the first 15 miles of its length. On the east side of the entrance to the strait a blunt promontory prevented them from getting a clear view to

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the south. They flew along its shore in a south-south-westerly direction for 10 miles, after which they were able to turn into what they thought was the actual strait itself, but here the visibility was very bad; they could see that its general trend was 189° true or slightly west of south, and when flying on this course the west side of the channel seemed to be cutting in front of them as if it were trending about 170° true or even more. The west shore was only just visible. To the south-south-east of their position there was a long black point formed by high mountains which ran approximately north-east to south-west, and was probably part of the same land mass which formed the eastern shore of the sound. What happened beyond this they could not see, as the clouds were right down to the shelf-ice itself, making further progress impossible, so they reluctantly turned for home.

On the evening of the day that Hampton and Stephenson made this flight, Riley and Bertram arrived with a load of seal meat. They had made a quick trip over a good surface and had found the cache without difficulty. Riley was driving some young dogs in his team which had not been away from the Base before. Like most of our pups, they had pulled well all the way and had not attempted to eat any harnesses or traces during the two nights they were out.

Although the sledging conditions to the north had been good, those to the south appeared very different, for Hampton and Stephenson had flown in close to Terra Firma on their way back from the sound and at 1.50 had seen Bingham and Fleming about 6 miles away from the island. Hampton reported that the surface looked heavy and that Bingham was wearing snow-shoes, while Fleming was using skis. They were travelling towards Terra Firma and, we reckoned, should reach the islands before dark. We certainly hoped they would, for it was always a nerve-racking business camping out on the sea-ice off such an exposed coast, especially when we knew that there was such bad ice and even open water not far to the west. Bingham, however, who was an experienced traveller, would have realized the danger, and we knew that he would make every effort to reach Terra Firma before nightfall.

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So we were not particularly worried when we were wakened in the night by an easterly gale whistling round the house and rattling the mooring wires against the tin roof. The gale lasted for five days, but at last died down on the night of August 21st.

We of course knew what provisions Bingham and Fleming had with them, and as they only had dog food to last on full rations until the day after the storm, Hampton and I prepared to fly down to them with fresh supplies.

We had the aeroplane warmed up and outside the hangar by 12 o'clock; then, while Hampton climbed into his cockpit, I packed myself into the cabin together with our usual emergency gear and three sacks of dog and man food to drop to the sledgers. When we taxied across the tide-crack on to the fjord we found that the snow was very deep and soft, with nasty hard wind ridges sticking through it. We doubted if we could take off without breaking or straining something, but when Hampton opened the throttle, the plane, as it gradually gathered speed, lifted nicely and skimmed over the surface, throwing the snow out in a bow wave like a racing motor-boat. We were soon in the air and opposite Red Rock Ridge, where we followed the coast round until we were over the Refuge Islands. We circled these to make sure that Bingham and Fleming were not there, and then headed for Terra Firma, flying at about 1000 feet. When we were some 5 miles off the islands we sighted the sledges ahead. We dropped down to a few hundred feet and circled over them. We could see that they were in very heavy going. Fleming was out in front on skis, making a trail for the dogs, while Bingham was driving both teams. When he saw us he held up an empty pemmican box as a sign that he was short of dog food. We circled again, and when we came alongside Hampton gave me the word, and I opened the cabin door and dropped out the first sack of dog pemmican. We repeated this manoeuvre until the provisions were all dumped. Then as the sledges appeared to be on a stretch of smooth snow and the plane was now light, I dropped Bingham a note asking him whether the surface were good enough for us to land safely,

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and if so, telling him to follow our usual procedure. After reading the note he and Fleming went out in front of the dogs and stood about 200 yards apart pointing with one arm into the wind. As the sky was covered with heavy clouds Hampton could see nothing of the surface, and only had these two figures by which to judge his height. He flew low past them, then circled back and landed safely. We taxied over near the sledges, and Bingham gave us an account of their journey since leaving the Base.

On their first day they found that the snow had smoothed out most of the pressure ice, but only very superficially, for they kept falling into deep, soft holes between the ice-slabs which had been tilted on end by the pressure. It took them four hours to reach Red Rock Ridge and another two before they arrived at the Refuge Islands where they camped for the night.

The next day—August 15th—they were up at six and got an early start. The going was soft and heavy and the men were forced to break a trail for the dogs, which were very tired by the evening when they camped on a large, unbroken pan. Bingham took bearings to fixed points in the coastal mountains, and when he plotted their position on the map, found that they had only covered 8 miles in 7 hours.

Conditions were much the same the next day, but they managed to arrive at Terra Firma in the evening, having done the last 3 or 4 miles in the dark.

In the morning they climbed to the top of the island to take a general look round and saw great clouds of snow being blown off the mainland. As the barometer was falling, Bingham wisely decided to remain in camp until they saw what the weather was likely to be. Soon after lunch an easterly gale started which blew all night, keeping them prisoners in their tent. The wind died down the next morning, and after lunch they lashed up their teams and prepared to drive out to find the dépôt. As they were leaving the islands they had an unpleasant experience which might have had very serious consequences when one

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realizes the time of year and the weather they had been experiencing. Here is Bingham's account of it:

"We were camped on a narrow strip of comparatively level snow, surrounded on two sides by the ice-foot which fell away steeply to the sea-ice about 15 feet below, while behind us there was a steep rise to the top of the island 500 feet above. The only way down was the narrow drift up which we had come. My team had been driven as far forward as possible until the leading dog was close to the ice-cliff, while Fleming's team was just clear of the tide-crack; the tent being pitched behind my sledge and in front of Fleming's dogs. As soon as we were ready, Fleming turned his dogs round and drove down the back trail to wait for me on the sea-ice. I carefully turned my team round uphill and on to the back trail, but the sledge was still on the wrong side of the tent. Being young and frisky, the dogs, as soon as they struck the fresh trail, shot off at a great speed so that the sledge whipped round too fast for me to guide it to one side of the tent. Disaster followed. The heavy iron-shod nose of one runner hit the middle of the tent and cut the cover like a knife, ripping a huge hole in one side. Luckily there was a runner on each side of the corner pole, so the sledge came to rest without doing any more damage. There was nothing to be done, except turn the dogs round again and disentangle the sledge from the wreckage. This was no easy matter as the dogs were on a fresh trail and keen to follow the other team. However, at last they were turned, and the sledge cleared from the tent without any further damage being done. Fleming soon reappeared to see why I was not following. I could only bring him round and, in silence, show him the ripped tent and await his just indignation. His only remark was, 'Thank God that's all—I thought your knee had gone again.' I might have known there would have been no outburst, for this remark was typical of him.

"We decided to stay in camp and start repairs immediately as the

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afternoon was already well advanced. With both of us sewing it took two hours to mend the tent and get the poles straightened."

The next day was fine, but although they spent all day looking for the depôt they could see no sign of it, and the fog forced them to return to camp about 4 o'clock.

The next day—August 20th—as they were already overdue, they decided to start for home, looking for the depôt on the way, but the weather broke again and they were held up for another two days.

On the 22nd they were up at 5.30 and made an early start. This was the day on which we landed beside them.

After hearing their news we said good-bye and then took off again to fly back to the Base. We should be back in less than half an hour, while the sledgers would be lucky if they made the distance in another two days.

Hampton and I had seen several seals after we passed Red Rock Ridge on the outward flight. These were the first we had found near the Base since the winter, so on the way home we thought we would fly outside Millerand Island and have a good look for more. By the time we reached home we had counted 18 in all, with one group of 7 round an open crack beside an iceberg about a mile and a half off the west coast of Millerand Island.

The day after the flight we went off with four sledges to collect the seals and arrived home in the evening with a good supply of fresh meat. From this time onwards we were never again short of dog food as there were nearly always seals to be found not very far from the Base.

Bingham and Fleming got home on August 26th. They had had an unpleasant journey since we left them, over appalling surfaces, which did not speak well for our future long journeys. The day we landed beside them, although they had light loads on their sledges, they only succeeded in covering 8.2 miles in 7½ hours. The next day they got into the worst of the rough ice, and after travelling for 7 hours had only sledged 6 miles.

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The temperature rose to nearly freezing-point the next morning, making the surface even worse; 8 hours' hard travelling, with the dogs floundering badly and the men sinking deep into the snow in spite of their skis and snow-shoes, gave them a distance of only 5 miles.

For the conditions during the last two days I shall quote from Bingham's diary:

"August 25th.—A most uncomfortable but satisfactory day. Up at six, but when ready to start it was snowing, with visibility nil, so we remained in the tent after packing up our sleeping-bags and camp gear. The weather cleared a little at 9 a.m., so we got out and broke camp. Before we got lashed up it was thick again, with no land in sight anywhere. Fleming again went ahead on a compass course with visibility about 100 yards. We thought we had only 4 miles to do to reach Red Rock Ridge, so decided to continue, although after covering 1 mile a hard wind started, accompanied by drifting snow. The pace was very slow and it was some hours before we had completed 4 miles, still without sign of land. We decided to go ahead, as in any case the wind was so hard that two men would have had great difficulty in pitching the tent. During the afternoon we had occasional glimpses of the ridge, and by 6 o'clock it showed clearly for a few moments. The surface was improving and the dogs kept going longer between stops. Suddenly we got on to the new ice formed after the mid-winter break-up. The snow had all been blown off it, leaving a good surface, and the dogs, seeing the land, broke into a trot. We reached the ridge in darkness and were lucky to find a good little amphitheatre where we very thankfully made a late camp.

"August 26th.—Up at 7.30, cloudy but clearing rapidly. The surface on this side of the ridge was better and we were able to get along comfortably. After doing about 4 miles the aeroplane met us and dropped a note to say that Bertram and Moore were coming out with a dog team to make a trail. It was a great help to have the track

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back to the Base well broken. They delayed lunch for us and we certainly enjoyed it."

After Bingham's team and mine, which Fleming had been driving, had had a few days' rest, we were keen to get started on the main journey, but before setting out we wanted to make the flight down the new sound. For when Hampton and Stephenson were forced to turn back on the 16th they had seen that there was far too much open water and rotten ice off the mouth of the strait for us to think of proceeding by that route, so we should have to find a way through the mountains to the south of the Wordie Shelf-Ice. Although finding a way through these mountains from the aeroplane was not essential, it would save us an enormous amount of time.

On the evening of August 26th the snow and wind started again and lasted for some time. There was no possible flying weather until at last, on September 3rd, the wind dropped, although the sky remained overcast, with low clouds, but then again the wind blew as hard as ever in the evening. The season was advancing rapidly and we really could not wait any longer in the hope of a day good enough for flying, so we decided to start sledging the next day. With the weather's usual perversity this turned out at first to be 'a flying day,' though actually when the time arrived it was neither one thing nor the other, and we hesitated for so long that in the end it was too late to start sledging that day.

We went up the hill frequently to see whether it was clearing, and at 11.30 decided that although it was still cloudy to the north it would be worth while for Hampton and Stephenson to fly south as far as Red Rock Ridge, and if by the time they got there it was clear in the region of the sound they could continue.

Here is Stephenson's account of the flight:

THE FLIGHT TO THE SOUND ON SEPTEMBER 4TH

"Fortunately it got brighter and clearer as we went south, and by the time we reached the mouth of the sound we had very good visibility

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in all directions. We were then about 100 miles from the Base, and since we could remain in the air only $3\frac{1}{2}$ hours, representing a total distance of about 280 miles, our flight down the sound had to be limited to 40 miles. As far as we could tell from the air the sound appeared to be about 10 miles wide in places, narrowing down to 5 in others. On the west there was a solid wall of mountains 8000 feet high, but we were unable to get a glimpse of what existed behind that wall. To the east, however, it was more open, and once we had passed the main headland at the entrance, the country was ice-covered and rising gently to a height of 4000-5000 feet well inland. In places there were steeper valleys down which much-crevassed glaciers flowed, and here and there bare rocky ranges pushed out from the high hinterland to form prominent black-looking capes.

"As we entered the sound, just off the headland there were large cracks in the sea-ice, some of them extending right across the sound. Close into the shore there were also large pools of open water, and it was obviously impossible to sledge into the sound by that route. Immediately south of the headland, however, the sea-ice finished and the shelf-ice took its place. For the first 30 miles this shelf-ice was badly broken up by glaciers pushing into it, and by large bergs breaking off from its free end. But by the time we reached our turning-point the surface looked absolutely flat and solid, with no rifts or hillocks in it. To the west the high mountains continued, but appeared to terminate in a cape about 20 miles further south. We could see nothing beyond this cape, and assumed it was the end of Alexander I Island, which from this point curved round to the west. On the eastern side of the sound the coast continued to the south, as far as we could see. It was misty in the far distance, but it appeared as if the land swung out to the west, for in the grey mist there was a distinct white line like the top of a mountain range.

"We had flown down the sound on a course of 174° true, and were flying slightly across it towards the southern point of Alexander I Island, so the general trend of the sound must have been about 10° east

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of south. We had reached lat. $70^{\circ} 10' S.$, and could see for certain as far as $70^{\circ} 30'$, but there was no indication at all of any strait coming through from the eastern side of Graham Land. Casey Channel was marked as being in lat. $69^{\circ} 30'$, but it certainly was not there. There remained the possibility that a channel existed to the south beyond the last promontory we had seen, but to settle that question we should have to wait for the time being.

“On our way back we kept to the same route, but searched the country in behind the headland at the entrance to the sound, to see whether we could possibly sledge that way and so avoid the open water. But the mountains were ice-covered, rose to about 2500 feet and looked passable. On rounding the corner of the headland we flew into the south-east corner of the bay and investigated the approach to the mountains from the north. Providing we could get on to the shelf-ice, it seemed quite an easy route over the col and down into the sound. We flew back over the shelf-ice and made a note of what we thought to be the best route to follow, in order to avoid the crevasses caused by the glaciers on the landward side, and the rifts caused by movements of the shelf-ice on the side nearest the sea.

“From the air the edge of the shelf-ice was an amazing sight, for it was a mass of long winding rifts with vertical sides, which seemed to run approximately parallel with the actual edge, but eventually curved round, and after widening out somewhat, finished up as an opening in the edge of the shelf-ice itself. These rifts showed up as clean white lines in the otherwise greyish colour of the shelf, and looked very much like dried-up river-beds. Finding one's way on to the shelf across these rifts would be rather like getting out of a maze, and would prove a very long job. Fortunately, towards the northern edge, about 10 miles south of Cape Berteaux, there was a large bay in the edge of the shelf-ice; here the shelf fell gradually to sea-level, and large rifts were absent. If only we could pick up this bay from ground-level we should have a fairly easy way up.

“We had a busy evening after we got back, for the various notes I

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had made had to be written up, a rough sketch-map drawn of what we thought the country was like, and then final preparations for the start which we were determined to make next day."

While we had been waiting for this flight, which Stephenson has just described, we had of course discussed every conceivable distribution of land and sea to the south of Marguerite Bay. So when Hampton and Stephenson returned we quickly formulated our plans, for, as Stephenson has said, we were determined not to delay our start any longer but to leave in the morning.

We would have two sledge parties; Stephenson, Fleming and Bertram, each with a team, would make up one party, while Bingham and I with our two teams would make up the other. We would all travel together over the pass and down to the sound. Then Bingham and I would turn to the west, behind what Hampton and Stephenson thought was the southern end of Alexander I Island, while Stephenson's party continued south along the Graham Land coast, and if they found Stefansson Strait, would turn east through it.

CHAPTER NINE

THE SOUTHERN JOURNEY

By A. Stephenson

A SLOW START

THE dogs were full of joy as they galloped down the sloping ice of the tide-crack on to the sea-ice on the morning of September 5th. Five sledges, each with a team of ten dogs and a load of about 1100 lbs., came one after another round the point of Barry Island, and their drivers waved to those left at the Base as they headed for the south. Fleming and Riley stood on the point and filmed us as we passed, after which Fleming came along with Hampton and his fast team, to take charge of his own team, which Moore had driven out for him. For the first 200 miles we were to travel together, but since we were to separate eventually, all our arrangements were made on the assumption that we were two separate parties. Rymill and Bingham formed one party, Fleming, Bertram and myself the other. Rymill and Bingham had one tent between them, whilst we decided to have two, two people sharing one tent for three weeks, leaving the third person in a tent by himself, and then when the 'single man' had finished a ration box (twenty days' food) we would change round. This proved an extremely satisfactory arrangement in that it meant a change of tent companions every three weeks, and each man in his turn took advantage of the extra room in the single tent to dry out any of his gear that had got damp.

Our course took us past Terra Firma Islands to the edge of the shelf-ice just south of Cape Berteaux, and up to this point we had an uneventful time. Uneventful as it was, we nevertheless had laborious periods owing to the rough surface, which had been deceptively levelled off by the winter's snowfall.

Thus, although beautifully flat to look upon, we soon realized that it

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was a mass of rough upturned blocks of hard ice, the spaces between which were filled with snow. Such a surface at the beginning of a journey is very trying, since the loads are at their heaviest and the sledges are difficult to manœuvre. One has to keep a continual watch on the ground immediately ahead, and if it looks as if the right-hand runner is obviously going over a big lump, then one runs up to the middle of the left-hand side and puts all one's weight against the load to prevent the whole sledge falling over on its side. It is not quite so simple as it sounds, however, for there may be obstructions on the left to prevent one getting alongside in time, or else the dogs may suddenly decide that it would be a good time to stop, and one is left at an inclined angle, supporting a falling sledge, and at the same time trying to give the sledge a certain amount of movement so that the dogs can start it again. Often one exerts a tremendous amount of energy holding up a 1000-lb. load as it moves with one runner up on hard ice and the other in soft snow; then suddenly a more uneven patch causes the whole lot to go over, with probably one of your skis underneath. There is nothing to be done then until the next sledge comes along, when with luck and much expenditure of energy you get the thing more or less upright, and while one man holds it you start the dogs and so get out on to the level again. This leaves a nasty mess in the trail for the sledges following and you usually have to go back to assist them through. Then you start off again, and with luck go some way without another mishap, but then again another capsize frequently occurs within a few yards, and all hands turn to once more. Sometimes, to avoid having to unload, and to avoid putting too much strain on the sledge, it is necessary to have three people to lift up an overturned sledge, which usually means getting assistance from the man ahead as well as from the man behind. For this reason one must be continually looking behind, and taking care not to get too far ahead.

Such travelling is heart-breaking enough, but not until we were forced to did we adopt the more practicable but even more heart-breaking type of travelling known as relaying with 'half-loads.' This

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involved travelling through the rough areas with half-loads at a fairly fast rate, or what appeared to be fast considering the nature of the surface and the tendency of skis; then, having got very hot, we were obliged to sit on the sledges and ride back for the other half, during which time we got so cold that it was with difficulty that we lashed up the sledge.

Soon after midday on the seventh day we reached the edge of the shelf-ice, about 60 miles from the Base. Most of this time we had been unable to see land owing to low cloud and mist, and we had travelled almost entirely on a compass course. This day happened to be a clear one, and on arriving at the shelf-ice we climbed up to see whether we had come to that region which from the air had seemed to be most free from crevasses. The cliffs of the shelf-ice are here only about 18-20 feet high, and in places are so drifted up that they can quite easily be climbed. The chances are, however, that one will climb up on to a berg that has come adrift from the main mass, so that a large rift separates it from the shelf-ice proper. Such was our experience on the first ascent, but from the top of the berg we were able to see the bay which ran into the shelf-ice, and the back of this bay sloped very gently up to the general level of the shelf. It was this bay which I had seen from the air, and we decided to sledge down it the next morning and so continue our journey. It was not the next day, however, nor the next, but the ninth day after our arrival at the shelf-ice that we were able to carry on. For eight days we had wind, snow and hopeless visibility. On one occasion we packed up and travelled 200 yards. It was a doubtful morning but we risked it. It snowed hard soon after we had started; the temperature was only 4° of frost; the visibility was negligible, and we soon found ourselves in some old pressure ice with leads of open water deceptively filled with slush and soft snow. That night, in spite of the warm weather, we had our stoves burning hard to dry our clothes. Two days of rain followed this, and then a bright afternoon afforded us a chance to prospect a route on the shelf-ice. On our way we came across a seal in the back of the bay,

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and were able to give the dogs a feed of fresh meat, which they greatly enjoyed.

On September 20th we were at last able to travel again; according to my diary "It has been the world's most marvellous day, with clear blue sky, lots of sunshine and a temperature of 38° of frost. The surface was slow, but after avoiding some crevasses and one or two large rifts we got into the middle of the shelf-ice, and by camping-time had done $10\frac{1}{2}$ miles. This day must have been a mistake, however, for the following day it was snowing hard again and travelling was quite impossible. Lack of visibility was holding us up badly at this stage, as we did not know the nature of the country in which we were travelling and at any moment we might be confronted with one of the many rifts or crevasses that seemed to be scattered haphazard throughout the shelf-ice. So far we had been away from the Base for seventeen days, on eight of which we had travelled, having done 71 miles with a daily average of 4.2 miles. This was not good enough, and Rymill decided to adopt a plan which he had considered during our long stay at the edge of the shelf-ice. Up to this date we had still hoped that when these two journeys were done we should be able to make an eastern journey across Graham Land in the summer. To do this we would have to get back to the Base from our present journey within about eight weeks—in fact, we had with us exactly eight weeks' food. It was now decided to cancel this summer journey, in order to allow us a longer time for the present two. With this in mind it was arranged that Rymill and Bingham should reinforce our party with food supplies and other gear, so that we could leave with a full eight weeks' rations, whilst they returned to the Base for fresh supplies. It was decided to make this change when we had got all the heavy gear up on to the land itself, a promontory of which we had to cross in order to get down into the sound." The next few days' travelling brought us to the edge of the shelf-ice, and to the crevasses which marked the beginning of the land-ice. Fortunately, on the gentler slopes the crevasses were well filled, and we were able to sledge straight across them. The steepest part was the first 700 feet, and we decided

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that we should get everything up by a series of relays, and that Rymill and Bingham would then turn back whilst Bertram, Fleming and I continued. It was a disappointing and thankless task to have to turn in their tracks and go back those 90 miles, the travelling of which had consumed so much time and energy, and our party were very grateful for Rymill's sacrifice in letting us go ahead. However, they were not to leave us without some token of remembrance, for as we were about to take our last loads up the hill one of Bertram's young ladies, with whom he was remonstrating for having been too fond of her harness as a form of food, turned on him and bit him above the lip, leaving a cut which required two stitches from the doctor's expert hand. It is worth noting that this was the only occasion during the whole expedition when anyone was bitten by a dog, and that in this case the beast was timid and rather wild. It was amazing really that Bertram could have handled her for so long without being bitten more often. On September 24th Rymill and Bingham returned to the Base, leaving us with eight weeks' supplies for ourselves and the dogs to get us back to Terra Firma, where they would arrange to have a dépôt left for us.

INTO NEW COUNTRY

Rymill and Bingham left us 700 feet up from the shelf-ice, and we had a further 2000 feet to climb before reaching the top of the col from which we hoped to see our way down to the strait. The weather continued to be bad, and not until September 30th did we reach the top and see the 'promised land.' We were not certain of the best way over the col, as I had only seen it from the air at a considerable distance. The slope was much too steep for our full loads, which were once more up to 1000 lbs., so the procedure was for two of us to go ahead on snowshoes or skis and prospect a route, at the same time making a trail for the dogs. We would then return and take up our loads half at a time. On one occasion it snowed and blew so hard after making the trail, that

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by the time it was fine enough to carry on there was no sign of it to be seen, and a further three hours had to be spent in arduously making a new one.

The afternoon before we reached the top was gloriously fine, and from a height of 2000 feet we had a magnificent view of the north and east sides of Marguerite Bay. Over 140 miles away to the north, Massif Gaudry, the 7000-foot range in Adelaide Island, pierced through the low cloud that hovered on the horizon. Swinging round to the east across the entrance to Laubeuf Fjord we could see the vertical cliff-face of Millerand Island, the island close to the Base, and it seemed strange to think that we were looking at something which we considered as home, after we had been travelling away from it as fast as we could for three weeks. The coast to the south of the Base was hidden by the promontory terminating in Cape Berteaux, and formed the north shore of the bay filled with shelf-ice which we had just crossed. There was a change in landscape south of Cape Berteaux, for to the north the plateau edge everywhere overlooks the coastal mountains, and the glaciers are small, running back only as far as the steep rock wall of the plateau, whereas south of Cape Berteaux there is no abrupt edge to the plateau and broad sweeping glaciers extend inland with a gentle slope as far as one can see. Here and there isolated ranges and mountains stand up, with only a solitary bare rock cape separating the snout of one glacier from the next. This vast field of ice all flowed into the shelf-ice in the bay below us, causing much disturbance there, and making it difficult to see clearly where land-ice finished and shelf-ice began. Inland from Cape Berteaux, and forming the north wall of the big east-west glacier, was a mass of low hills and glaciers in which remnants of the recent storm still lingered. The wind was still blowing, and everywhere black turbulent clouds of drift were swirling up the dark windward side of the mountains. As they passed over the top they were caught by the sun's rays and changed into white foam which broke and disappeared in wisps of grey out to the west. It was pleasant to stand in the shelter of our camp and to look down upon such a view, but after one had stood

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still for an hour and a half looking at it through a theodolite its appeal was less and the warmth of the tent was far more attractive.

Our stay in the tent was brief, however, for soon after the sun had set, Jupiter and Sirius were just visible and we went out to do longitude and azimuth observations whilst it was still light enough to use the theodolite without assistance from an electric torch. Later in the evening we turned out to do a latitude observation and take a time signal, so that by the time we finally went to bed we felt that our position was well fixed, and we could start out into new country on the morrow from a known position on the map.

It was foggy on the day we reached the top of the col, and we travelled slowly on what I thought was the right course to bring us down to the sound. At midday visibility was almost nil and something seemed to tell us that it was time to stop. By 4 o'clock it had cleared considerably and Bertram and I went on to see what lay before us. A few hundred yards ahead of us and to the east was a very steep drop to a much-crevassed glacier running northwards into the shelf-ice we had just crossed, and as we looked down into its chasms of blue we were grateful we had stopped when we did. To the right of our course, however, there was a slight rise, which we climbed, and there before us lay a veiled picture of the country we had come to explore. Occasionally the patches of cloud would roll on, lifting the veil from some hidden peak, whilst in the foreground everything was clear and we could see quite distinctly the peculiarly shaped mass of red rock which I remembered as marking a possible descent from the glacier to the shelf-ice. In the background of the picture, through gaps in the clouds, could be seen a glistening ice-covered range, the southern continuation of the mountains of Alexander I Island.

The following day there was a brilliantly blue and cloudless sky, and we and the dogs were full of the joy of living as we raced down slope after slope of glistening wind-driven snow. We did 25 miles that day, and called our dogs to a halt with that very satisfying feeling that everything was with us, and that we should not have to go back the next day

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and get the other half of our loads. It is strange to look at a small neatly lashed 12-foot sledge and to think that everything one needs for the next two or three months is held on it. Without that sledge one might exist for a short time indeed, and yet with it and its contents one could be safe and comfortable for three months, despite almost any conditions that might arise. Bearing this in mind, one naturally does not like relaying loads, when half of one's worldly belongings have to be left in a small desolate pile, a mere speck in a vast field of ice. We were happy, then, to think that the time had now come when we would always be able to travel with full loads. Coming down from the col, most of the time we travelled over ice-covered hills, and on approaching the rock promontory which ran down to the sound we had to cross a glacier with numerous crevasses, which fortunately we found to be well covered with snow-bridges.

We were now at the edge of the sound, in a position to start mapping it, and as the next day was fine we decided to remain in camp and make it a 'survey day.' This meant that Fleming went off geologizing whilst I, with Bertram's help, did some astronomical observations and some rounds of theodolite angles to the outstanding mountains and points.

The country on the east side of the sound was similar to that further north, in that it consisted of glaciers and promontories stretching inland as far as one could see. The coast on the other side of the sound, however, was very different. As far as we could see to the north and south a solid wall of mountains confronted us, rising to some 8000 feet. It was not a broad range with summits some distance inland, but a steep-faced ridge running parallel with the shore, from which it rose abruptly. There were a few foothills and bays of ice, but behind there was just a straight wall of bare rock or a slightly less precipitous ice-covered wall. The sky-line was of a scalloped formation, here and there dipping down and allowing ice-falls to pour through from the interior. The whole of this was entirely new country, and we were very keen to get on with our survey and see how high the mountains really were, and where exactly on the map they would appear.

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It was still early in the spring, and I was able to do star observations in the evening. Our general plan of work on this journey was to determine astronomical positions every 30 or 40 miles, and from these positions to take a round of theodolite angles both horizontal and vertical, to fix the major landmarks. For the intervening detail we relied upon compass bearings taken at each camp and lunch-halt, using the dead-reckoning position based upon the compass course and the sledge-wheel reading. Our daily course was plotted each night in the tent, and the dead-reckoning position corrected whenever our astronomical position was determined. Compass bearings were plotted each night, and so a rough sketch-map of the area slowly evolved as we proceeded.

From this survey camp we got down to the shelf-ice without much difficulty. Most of the crevasses were bridged, but on turning one corner rather sharply, my sledge swung across a weak part and one runner became jammed under the lip of a big crevasse. The sledge had to be kept from falling down by two people whilst the third unloaded it, before we could get it back on solid ice again. I was also hampered by the fact that during the day I had split a piece 2 feet long off my ski, which made my course downhill somewhat erratic.

We reached the shelf-ice of the sound by 5 o'clock that evening, and were once more in a region of those strange rifts peculiar to the disturbed areas around the edge of shelf-ice. We were some miles south of its northern edge, but the ice was greatly disturbed by glaciers pushing into it, with the result that it was a mass of hummocks interspersed with rifts and depressions. Some of these rifts had walls 30 feet deep, and were probably half a mile wide, whilst others were just a few hundred feet wide, with sides drifted up with snow. In other places the ice was pushed up along the plane of a tension crack into a vertical wall. This was all quite obvious in clear weather and could easily be avoided, as the banks of nearly all these depressions were in places drifted up to such an extent that one could pick a way across. Unfortunately, our introduction to this form of topography was in misty weather, and we

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were never sure what to expect next, and were therefore compelled to await clear weather.

My diary, for instance, on October 4th reads:

"It was snowing and misty at 6 this morning, but cleared at 7.30, so we decided to get on. By 10 o'clock it was bad again and we travelled on a compass course for $2\frac{1}{2}$ miles. It seems that we are on shelf-ice with tremendous pressure ridges caused by the huge glaciers debouching into it. The steep parts on the whole are drifted up, and we were going up and down short steep hills 50 to 100 feet high. In places, however, there are big gaping rifts which have not been drifted up. It was one such which stopped us after $2\frac{1}{2}$ miles, and caused us to change our course to west, to get outside this pressure. After $1\frac{1}{2}$ miles more we came to a very big rift with vertical sides stretching right across our course. It was snowing and visibility was hopeless, so after lunch I decided to camp and wait for better light. I entered the tent at once and started gluing my ski, whilst Bertram went to see whether he could find a way round the rift. He returned very shortly with the amazing news that there was a live seal at the bottom of the rift. Three hours later we were enjoying the liver. Bertram and Fleming took three boxes and filled them with meat for tomorrow, as we had already fed the dogs tonight. The rift was 40 feet deep and they got down the side of a wind drift. The sides were all well stratified as in shelf-ice. This means there must be some 250 feet of ice under the water, and the seal must have swum under it from some incredible distance. It is certainly an interesting country—but I should like a bit more light to see it in."

The discovery of this seal, some 8 miles from the edge of the shelf-ice, provided us with a topic for discussion for some days to come. In the end, Bertram's provisional conclusion was that since the shelf-ice must have been about 250 feet thick here, and the distance was 8 miles, the seal must have come over the top rather than underneath. The possibility of coming along by the tide and other cracks over such a distance was not credible. The seal was active and in good health, and was fortunate in at last finding a rift with free water at the bottom. It had

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not fed for a considerable period, since its stomach was quite empty, and it is doubtful (although there is no evidence as yet either way) whether it would have found any fish or squids under the shelf-ice. Why it came over the ice was another problem. Previous expeditions, the *Terra Nova* Expedition in particular, have found ancient seals, thin, battle-scarred and dying, even up to 20 miles from sea, and several thousand feet up in the mountains. It was presumed that they sometimes do such things to hide away and die in relative peace. The seal we discovered possibly had the same idea. Another possibility is that it had been hit on the head (as might quite easily happen to a seal) and had lost all sense of direction.

However, regardless of how or why it had arrived there, we enjoyed its liver very much, and the dogs were to enjoy its blubber for some time to come—for we cut it up into small pieces and packed it in a dog-pemmican box, which we took with us. Later in the journey, when the dogs were tiring of pemmican, we gave them each a lump of blubber with their pound of pemmican, which made their lives worth living again for the brief portion of a second that the blubber lasted. We were able to repeat this every fourth night or so until we returned to the same place a month later.

It took us three days to do the 15 miles necessary to get clear of this bad area, and to cross the biggest rift, which stretched right across the sound and was $\frac{1}{2}$ mile wide with 30-foot cliffs. Our course led us to the only part of the northern cliff which was drifted up, and we descended somewhat precipitously with the aid of chain drags on the runners.

Once south of the big rift the sledging was good and we enjoyed day after day of that type of travelling which one always remembers afterwards as being one of the most thrilling times of an expedition. We did between 20 and 25 miles a day; on either side of us was new country, and beyond us, always just hidden from view, was what we were longing to see all day. As each day passed, fresh promontories would loom up on the east side of the sound, and to the west the 'last point' remained as far ahead of us as ever. Did this sound go on for ever, or would it

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one day disappear? Expectantly we approached and passed the promontories on our left, wondering whether we should suddenly come upon the mouth of a channel running eastwards. There had been no sign of Casey Channel, or Lurabee Channel, and now as we approached and passed lat. 71° there was no sign of Stefansson Strait, and still the coast-line ran on continuously to the south.

Our chief aim was to survey the eastern side of the sound, but the whole time we were being equally attracted by the western side, which since lat. $70^{\circ} 30'$ had changed its appearance completely from a steep 8000-foot range with scalloped sky-line and corried faces to lower flat-topped hills, still high, but no longer backed by razor-backed ridges. These lower hills were particularly interesting in that they fell away on the east in steep rock bluffs to the sound below, and these rock bluffs were evidently made of stratified rocks. We were too far off to be certain, but if these stratified rocks were sedimentary, as would most probably be the case, it was a most important geological discovery. Up to this time the work of the expedition had been restricted to Graham Land and the many islands which lie off the coast, and everywhere the rocks, where they were free from snow, were igneous types closely allied to those which occur in the Southern Andes. Now, however, we were looking at a completely different formation, and it was a welcome relief from the somewhat monotonous similarity (geologically speaking) of the formations that had so far come to light. In addition, if these rocks proved to be sediments, the sound must lie along a major fault plane, bringing the two formations in close juxtaposition by a vertical movement of perhaps several thousand feet. Faults are of course common features in the earth's crust, but the discovery of one of this magnitude in a land where structure was difficult to determine was an important clue to the formation of West Antarctica.

As we travelled south down the eastern side of the sound we frequently took out our field-glasses and examined the west coast very carefully, and we became convinced that the stratified rocks were really sedimentary and not just a series of interbedded lava flows and ashes. If

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this were so, then there should be a fair chance of finding fossils, which would help in dating the formation. So we continued, eager to go on and see what was ahead, but at the same time eager to return and see what we could find on the west side of the sound.

Although geology and survey primarily interested Fleming and me, Bertram, our zoologist, was keenly interested in all our problems, and at lunch-times we had many discussions on the various features of interest which we had passed during the morning. Many were the problems which confronted us. Was the main sound down which we were travelling a rift in the earth's crust caused by a major fault, or some other formation? If it were a fault, when did it occur in relation to the formation of the sedimentary rocks, and what has happened to the latter since to make them assume their present sloping and folded formation? We frequently wondered, too, whether by going south we should get out of the region of strong northerly winds; if so, we might get some idea of the régime which controlled the weather at the Base. We thought we had come to some conclusion about this, for our first strong winds in the sound were southerly, but a few days later our conclusions were shattered by a howling wind from the usual northerly direction.

Our routine at this stage of the journey was to get up at six, and usually we had had breakfast, struck camp, loaded the sledges and harnessed the dogs by 8.30, sometimes doing it in $2\frac{1}{4}$ hours. The speed with which this is carried out depends a good deal on the surface. If it is a clean, hard, wind-driven surface, then carrying boxes from tent to sledge is easy and quick work. If, however, the surface snow is soft and deep, carrying boxes is very slow and hard work, and small articles like gloves or a hat, which one often discards for a few minutes, have to be put on a box rather than just thrown on to the snow. After some days of working in soft snow, the feeling of walking on a good hard surface is very exhilarating—akin to the feeling of putting on gym-shoes after wearing heavy boots for some time.

When all the teams were ready, Bertram would lead off and Fleming

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and I would wait until he had got some distance ahead, when we would follow. The start in the morning was always thrilling, as the dogs were keen to go and dashed off at great speed to catch up with Bertram's team, although at the same time they could not resist the temptation of calling in at the tent site to see if any edible and delicate morsel had been left. Around the tent site was usually a mound of snow, and occasionally an empty ration box or dog-pemmican box. These were all taken at a fast pace, and for a few seconds one was fully occupied in an endeavour to keep the sledge upright, to keep both skis going in the right direction, not to mention in their correct relative position, and, whatever happened, to maintain a tight hold on the sledge, for at that stage nothing would stop the dogs until they had caught up with the sledge in front.

Once the sledges were clear of all initial obstructions, we settled down to a steady course, either on a compass bearing or on a clear landmark ahead, whose bearing we knew. If all were going well we would travel for 2 to 2½ hours before stopping to disentangle the traces and give the dogs a rest, after which we would go on till one o'clock, when we took an hour off for lunch. At each stop when necessary, and certainly at each camp and lunch-halt, I took a round of compass angles and made a few sketches whilst Fleming entered up any interesting glaciological notes. At the lunch-halt, too, we made the meteorological observations, reading the temperature, pressure, and noting the direction and force of the wind and the formation of the clouds. These observations were made in the morning and evening as well. We aimed at getting eight hours' sleep each night, which meant going to sleep at 10 p.m. In order to do this, and at the same time write up our notes each night, we had to stop sledging at 5 p.m. Pitching camp at night, again, is very variable according to the surface. If the snow is soft and deep, then every package put down gets snow in all its cracks and folds, and before handing it into the tent all this loose snow has to be brushed off—the strongest possible argument for having a neat, simple kit-bag or rucksack, without numerous pockets and flaps. When we had finished

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supper and written our personal diaries we still had plenty to do. The day's course had to be plotted and a rough map made from the bearings. All my sketches, which on some days were quite numerous, had to be pencilled in with a heavier line, as during the day when one's fingers are very cold, it is impossible to draw in lines sufficiently hard not to require going over again. Fleming always had numerous notes to write up on the glaciology and geomorphology, and when Bertram was not writing down his own ideas he was extremely helpful in doing odd repairs to harnesses, skis or personal clothing, for which Fleming and I had not the time.

By October 16th we had reached lat. $71^{\circ} 30'$ and our course had taken us quite close to a large rock outcrop on the eastern shore of the sound. Glaciers coming through this rock mass had brought down specimens of its rock, and we were able to get a good selection of representative rocks without going on the land itself. This large mass, lying just south of the mythical Stefansson Strait, had been our landmark for some days now, and we had seen nothing beyond it at all. The strait here narrows down to about 10 miles, and the constriction has caused the ice to pile up somewhat in the narrowest part, with the result that most of the time we were gradually climbing, with never a really good view ahead.

Once beyond the narrowest part, and south of the high mountains to the east, we had a clear view. For many days we had wondered what lay beyond that large mass of mountains ahead, and we had sledged eagerly up every slope, thinking that we were bound to see something from the top—but on arriving all we had seen was yet another slope. However, on this day we really got to the top and at last saw something new. No longer did the east shore continue just as far as the next rock promontory, but, instead, it changed into broad sweeping glaciers, with only isolated mountains here and there, and, the biggest change of all, it began to curve round in front of us. To the west, Alexander I Island at last seemed to be petering out; there was no longer a continuous mass of mountains, but broad glaciers interspersed with rock outcrops,

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and finally there appeared to be just a long glaciated tongue running to the south-west, reminding one of the western glaciated slopes of Anvers and Adelaide Islands. The next day, the 19th, we went on to lat. 72° , from which position we decided that two more days would give us very little added information and, as we were already two days beyond our scheduled time for turning back, we very reluctantly decided to stop. Not more than 10 miles ahead of us were some rock outcrops marking the edge of the shelf-ice and the mainland. From the last rock exposure the country was completely glaciated and crevassed, and ran for some 50 miles slightly west of south before disappearing from sight. To the south-west we could see what appeared to be the end of Alexander I Island, a long glaciated point. What happens beyond this point we cannot say, but our general impression as we looked upon it then was that the sound curved round to the S.S.W. and widened considerably, suggesting that it opened into a bay west of Alexander I Island. We were still on the shelf-ice although our position of 72° S. and $67^{\circ} 18'$ W. put us 70 miles inland on the existing map. It was thought that the edge of the continent, in about lat. 71° , ran approximately in an east and west direction, but it was quite obvious to us that at any rate as far south as $72^{\circ} 30'$ the main trend of the coast was still in a north-south direction, and that beyond that latitude, although we could not see it, the coast probably turned gradually into a south-westerly direction. It is quite certain, however, that in this part the edge of the main continent is much further south than was previously supposed. Our journey had also proved that from the Base to lat. 72° there was no sign of a through channel on the west coast of Graham Land, and this fact, together with what we had seen sledging and flying north from the Base, proved that there was no break between latitudes 67° and 72° . On the other side of the sound we had shown Alexander I Island to be some 300 miles long, instead of only 50; but concerning its possible extent westwards we had no idea.

It was now October 19th, and we had been away from the Base for forty-five days, having covered 295 miles. We had thus averaged but

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6.5 miles a day. When one considers that we travelled on only twenty-five of those days, the actual travelling average goes up to 11.8 m.p.d. Our journey home, if anything, would be slightly further, and there was no reason for supposing that the visibility would be any better than on the way out.

On the way back, our main object was to land somewhere on Alexander I Island, where the stratified rocks were fairly accessible. At this time we were getting early morning temperatures of 47° to 52° of frost, and the days were now considerably longer. The effect of the sun's heat was becoming daily more appreciable, and the midday temperatures were often up to 12° of frost, making sketching and the writing of notes during the lunch-time halt quite a pleasant occupation rather than something that had to be done quickly before one's fingers became incapable of holding a pencil. We were still being held up periodically by wind and drift, but on October 22nd we landed on Alexander I Island, having done 110 miles in the week.

We were the first people ever to land on this island, which was discovered by Bellingshausen in 1819. We were in lat. $71^{\circ} 15' S.$, and the approach was very easy, as the shelf and land-ice merged into a smooth slope, up which the dogs raced, being brought back to life again by the sight of rock close at hand. We left the dogs and ran excitedly to the nearest rock, for as yet we were not absolutely certain that the rock was of a sedimentary type. However, we soon made our 'assurance double sure,' and that night went off to sleep feeling happy that we had discovered sedimentary rocks in this region of the Antarctic, and keen for the morning to arrive, when we could go and search for fossils. Even if the rock were fossiliferous, it was a pure gamble whether we should strike a bed that was fossil-bearing. However, with all the eagerness of the prospector we scrambled up scree slopes and frantically picked up piece after piece of rock, turning it over and throwing it down. At last Fleming shouted that he thought he had something that resembled a fossil, but that it was very small. He threw the rock down into the snow where I was standing and asked me what I thought of it. I picked it

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up and was surprised to see the impression of a shell about 2 inches long, and said that there was no doubt at all that it was a fossil. Fleming was somewhat surprised at my certainty, and then it suddenly dawned on us that Fleming had been so interested in his minute possibility that he had not seen the large certainty on the other side of the piece of rock at all. After this, we found various specimens, all very clearly fossils, and, though some were compressed and distorted, many of them were identifiable. We also found remnants of fossil plants, and altogether we collected some forty-eight specimens, and were satisfied with our brief stay—and brief it had to be, as we wanted to call in again further north and our food supply was limited. Unfortunately, we could not expect our return journey to be much faster than our outer one, as, although the loads were lighter, the dogs were getting more tired, and we therefore had to push on whilst the visibility was good.

We continued north again the next day and passed through many interesting glacial phenomena. The edge of the shelf-ice where it comes up against Alexander I Island is undulated, with fresh-water pools in the troughs of the undulations, presumably a result of the pressure exerted by the big glaciers pushing in to the east side of the strait. Elsewhere there were resemblances to ancient stoneworks, looking as if the Druids had passed that way. There was a slight rise in the ice, up to a crater-like formation with great slabs of ice resting all round on the inner slopes. In the centre was a mound covered with rectangular blocks of ice. It looked as if there had been an enormous hollow dome which had suddenly collapsed, and that the broken pieces of the roof were scattered round the hollow and resting on a mound in the middle. The main formation was about 100 feet deep and $\frac{1}{4}$ mile across, and discussions as to how it occurred kept us occupied for many subsequent days.

A second landing was made in Alexander I Island in lat. $70^{\circ}45'S.$, and more rock specimens and fossils collected. This camp was an extremely pleasant one in its general situation. From the sound it looked like the last accessible point of exposed rock, but on approaching it we found a beautifully sheltered bay in behind the point. It seemed that we had

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suddenly come into an oasis, for instead of the usual mass of ice and snow with occasional patches of rock there were large valleys of exposed rock, with scarcely any snow to be seen. Had there been any water in the valleys, the landscape would have been strongly reminiscent of North Wales. These were dry valleys, however, the dust from which was scattered around, causing a much more rapid melting of the ice than usual, and hence a greater exposure of rock.

We referred to this camp as 'Ablation Camp'—ablation being the name given to the processes by which the snow disappears, either by melting or evaporation.

Here we collected a new variety of fossils, chiefly brachiopods and belemnites, and the place was a veritable geologist's paradise. Not only was there quite a number of fossils, but the rock types were unusually varied—limestones, sandstones and shales of different types interbedded with one another; and in the bottom of the valley there were erratic blocks of igneous rock which had been brought by the ice from some unknown locality—presumably the hinterland of Alexander I Island—and left on its retreat. Some of the shales near the camp were filled with plant-remains, and it would not have been surprising if we had come across some coal-seams. In all, we collected nearly one hundred specimens whilst working from this camp.

It was now October 28th, and although there was a great deal more which we should like to have done, we felt we had to concentrate on getting home. We had twenty-two days left in which to cover a distance which had taken thirty-two days on the way out. Our last day at Ablation Camp was one of the windiest we had had in spite of its sheltered position, and in the periods of calm we could hear a tremendous roar, like that of distant breakers, out in the sound itself. On such days as this, if we were forced to lie up, we usually fed the dogs about 3.30 p.m. and all three of us had tea together in one tent. There were not many subjects that were not discussed during those very companionable hours when we lay listening to the forces of nature creating havoc outside. As the journey drew towards its close, one of the most popular pastimes

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was the anticipation of the good things of England, chiefly, and becoming every day more so, in terms of "a marvellous place to get a meal. Gosh, what wouldn't I give for some strawberries and cream!" or "When you are going down from Cambridge, do you ever stop at —? you can get marvellous teas there." Whereupon the conversation was interrupted whilst we took another mouthful of the precious sledging-biscuit which had to last as long as we could make it. If it happened to be a Sunday, then Fleming would read Evensong, after which our conversation would probably be more serious, but in the end would finish up with 'thoughts from abroad on a Sunday-evening cold supper.'

Although we were continually thinking of England in these pleasant terms, we were never at a loss to appreciate the calm beauty surrounding us, especially in contrast with political disturbances at home. This was brought to me very vividly one night when I was waiting to get a time signal. The time-signal set was always placed outside the tent to prevent condensation, and I had gone out rather earlier than was necessary. It was a glorious evening, and I knelt down by the set and was soon completely absorbed in listening to a broadcast of a public meeting in Europe. The speech was highly oratorical and the audience was completely carried away, cheering wildly, with the result that for five minutes I was back in Europe. Slowly, however, I became conscious of the things in front of me, and then suddenly I looked up, and the full beauty of my surroundings came upon me as if I had suddenly been transported here. To the east the silvery mountains cut clearly into a dark blue sky, whilst to the west the ice-covered mountains and glaciers were floodlit by the long rays of the setting sun. Everywhere was complete calm and silence; there was not a sound from the other tent, and only occasionally did a dog stir, make himself a bit more comfortable, and then bury his head again amidst his paws and tail. We were further south than anybody else in the world, and apart from our companions at the Base, there was no human being within 1500 miles. It made one feel extremely insignificant to see and think of such vast

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areas untouched by man, and in which man has had no influence whatsoever. However, I took the liberty of calling in the help of the transmitter from Washington, and with this time signal and the sun observation I had made during the day I was able to add the position of this lonely yet wonderful spot to man's plan of the earth.

The strong wind we had whilst at Ablation Camp had produced a good surface in the sound, and the day we left there we did our record distance of 26 miles, in spite of a late start and stopping at 5 p.m. We had left a *dépôt* by an outcrop of rock at the edge of the land-ice on our way down on the east side of the sound, and we now made a direct course for it. We were unfortunate in that as we approached the area of pressure and rifted ice the weather deteriorated and visibility became very bad. We went on, however, stopping every time the area ahead of us became a mere blank. On these occasions Bertram would go ahead and flick out his whip to its full length; if the whip fell on the ground and was visible he proceeded; if it just disappeared into space, then he stopped and prospected to the right and left. Unlike crevasses, these rifts do not occur in any special direction or place, and one is just as apt to find them at right angles to the course as parallel to it. Frequently they occur in both directions. As we sledged we could often see a patch of blue in the mist to one side, and we used to watch it carefully to see if it turned in front and across our path. Elsewhere streaks of white in an otherwise grey mass indicated a break of some description and we had to go carefully. Driving the leading sledge in this type of going was a great strain, not only in looking ahead, but in being in a constant state of hesitancy whether to go on or stop and prospect. Through all this area, and indeed throughout the whole journey, Bertram had the leading sledge, and he is to be congratulated on having taken us through with no mishap. We nearly came to grief, however, on one occasion when he and I went ahead to prospect a route in very bad visibility. We were going down what we thought was the drifted side of a rift, and were convinced we were at its lowest point, since we could see a pool of water around a block of ice at the bottom,

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which we thought was on the same level as we were. The next second we were undoubtedly at the bottom, but in the meantime we had fallen through space for 30 feet and had landed upside down, fortunately in a soft bank of snow. We walked along the bottom of the rift, twisted but otherwise intact, and climbed up a drifted bank to the top again, where we joined Fleming, who was beginning to have fears for our safety. When the visibility improved we realized that what we thought had been a bank sloping down to the bottom of the rift was merely the sloping lip of an overhanging cliff. Undoubtedly we had been extremely lucky, for we had not broken even a ski, and we were duly impressed with the necessity of keeping our eyes open, and of the inadvisability of travelling in bad visibility. Unfortunately our food supply would not allow us to be too circumspect in this matter, and it became tantalizing having to lie up in calm weather.

One day whilst we were looking into one of the 'misty' rifts we saw an odd black speck jumping up and down on the far side. The light was very bad and changeable, so that this strange object was at times very large and at times a mere speck. We thought at first it was Rymill and Bingham coming down the steep side of the rift, then it disappeared altogether. A second or two later we were amazed to see a penguin coming up the slope just beneath us. We had seen no living thing save a few snow-petrels and lichens since we had killed the seal a month before, and this penguin so many miles from open water was certainly a surprise. There were others, though, who were far more surprised and happy to see it—for the dogs, who had been living on pemmican for a month soon smelt this stranger, and a few seconds later some tail quills and the blood on the dogs' lips were the only visible signs of there ever having been a penguin there.

It seems that at this season the penguins have to go over about 30 miles of unbroken ice to get to their nesting-places, hopping steadily along or sliding on their stomachs, with occasional halts for a rest or a talk. The unfortunate individual who came our way must have taken the wrong turning at the last resting-place, and come 30 miles over the

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ice at right angles to the course which the others took, for, apart from two more stray ones which we met the following day, we did not get to the big rookery until we were only 10 miles from the Base.

At an earlier stage in the journey we had considered the wind as our worst enemy and lay in our tent day after day praying for it to stop. Little did we think then that before the end of the journey we should be praying for the wind to blow and get rid of some of the mist and cloud, and moreover to harden up the surface, which was now becoming very soft and sticky. The days were getting warmer and it was impossible to slide a ski through the snow; after each step taken the ski had to be lifted with its heavy weight of clinging snow.

With such travelling and visibility it was not until November 9th that we reached our depôt, having taken nine days to travel 29 miles. By this time we were wondering whether we were going to get home by Christmas, as we still had crevasses and more shelf-ice to cross, for which clear weather is wanted, and then we had the sea-ice to cross, the state of which we could only conjecture. We had already cut down our rations and were making one box last two men for twelve days instead of ten. We had killed off seven of our weakest dogs some days before in order to make the dog food last us to Terra Firma, where a fresh supply awaited us. On the way out it had taken us twenty-one days to get from Terra Firma to our camping-place of November 9th. Admittedly we had not to prospect a route and get heavy loads up the col, but we only had ten days instead of twenty-one, and there was no reason why the visibility should be any better now than on the way out.

The following day was misty again, and we had to prod, with an ice-axe, for every single yard of our way through the crevasses, which took us till lunch-time, after which visibility improved and we began our climb to the top of the col. Following on our days of despair at the bad state of the weather, we suddenly got a record break of five consecutive fine days. In this weather our journey up the col was almost as pleasant as our run down on October 1st, and we were enjoying the view from the top on November 11th when we espied two black specks moving in

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the distance. For some time we had been wondering whether we should meet Rymill and Bingham, and where. It was important that we should meet them to tell them that they could not reach Charcot Island by going round the south end of Alexander I Island unless they were prepared to stay out for twice as long as we had. The two specks soon resolved themselves into human beings, and at 3 p.m. we exchanged greetings and listened to a concentrated hash of the past ten weeks' news. From where we stood at a height of 3000 feet we commanded a magnificent view to the north of Adelaide Island and Marguerite Bay, and it was a fateful coincidence that in this spot we should receive the sad news of the death of Dr. J. B. Charcot, the pioneer explorer in the country upon which we were then looking.

Rymill and Bingham had come up from their dépôt 700 feet above the shelf-ice with light loads, to make a trail. We made a rapid journey down the col to their camp, and there we discussed our discoveries and their plans. Rymill and Hampton had flown some distance down the sound and had realized that Alexander I Island was much longer than previously believed, so that they were not surprised at our results and were reassured in their decision to go east from the top of the col rather than west.

We left them on the 12th, and being blessed with good weather we were able to reach the Base by the 19th, having stopped for one day's survey work at Terra Firma. We took what food we needed from the dépôt which had been left there, and proceeded home with the comforting feeling that we could now eat as much as we liked. The journey was uneventful excepting for the spasmodic bursts of life introduced into the dogs by the sudden appearance of a seal with her young pup, or an inquisitive penguin who was determined to see a dog team at close range. Unfortunately for the penguins, they never lived to relate their experiences to their comrades. On November 19th, as we were starting our last day's journey, we ran into a large rookery of penguins and spent a considerable amount of time disentangling two teams who had converged on the same poor penguins. After the mêlée two of Fleming's

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dogs were missing, which accounted for the strange apparition which confronted Hampton and Meiklejohn, who that day had come from the Base to collect penguins' eggs and were surprised to see a bearded and bedraggled traveller dragging two unwilling dogs through a swarm of pecking penguins.

And so we returned to the Base after seventy-five days' absence, during which time we had covered 600 miles and mapped about 500 miles of coast-line, 450 miles of which had never been seen before. It was a strange contrast to be back again. For nearly eleven weeks we had worn the same clothes; we had eaten off plates that had never been washed but merely scraped; our hair was long and matted. The memory of that first evening at the Base will long remain as one of the pleasantest we have experienced. We revelled in every minute of it. We were soon washed and shaved, and once again in clean clothes. Then we sat down to a meal of fresh penguins' eggs, from crockery that appeared dazzling in its whiteness.

Outside, the dogs, our fellow-travellers, were going to the other extreme. For eleven weeks they had been away from dirt; they had slept each night in the snow, and were beautifully clean, with nice glossy coats and bushy tails—and now they were revelling and rolling in the dirtiest and most 'blubbery' places they could find. They were wallowing in piles of very old seal skin and blubber that had been collected and put on one side, and when they had finished with these they would roll in the cinders and ashes that were scattered around. By the time that we were clean and comfortable they were like a crowd of children that had been playing in a clay pit on a wet day—only instead of clay that would wash off it was grease that would only grow off. Yet they were just as happy as we were—and they certainly had every right to be, for theirs had been no light task. They were fine workers and admirable companions, and it is a great pity that they could not share the thrills and pleasures which we derived from the journey. Our results, however, are as much a testimony to their loyal devotion and friendship as to our powers of observation and deduction.

CHAPTER TEN

SOME SLEDGING AND SUCCESSFUL FLIGHTS

I WILL now take up the story again from the time Bingham and I turned back, leaving Stephenson, Fleming and Bertram to find their way down into the new sound.

Stephenson has already given the reasons for our returning, and when we left them I was happy in the knowledge that the party was being led by a well-trying and efficient sledger, who was not only capable of bringing his men through happily and safely, but had had enough experience with dogs to get the maximum amount of work out of them combined with humane treatment. There is a great deal more in dog driving than the actual control of a team when it is moving. The leader of a dog-sledge party, which is out for a long period, cannot give too much thought to the management of the teams. He must watch the individual dogs and know from experience when they have had enough work for one day. If he tires them too much at the beginning of the journey, when they are probably fairly soft, they will lose condition rapidly and never pick it up again. Even when they are fit, the number of hours which they should be allowed to work in any one day will depend on the condition of the snow surface over which they are travelling, and the weather at the time. Another thing that he has to watch is the weight carried on each sledge. If the snow has a good, hard crust, which will stand the weight of the sledges, they can all carry the same weight provided the teams are evenly matched. But if the snow is deep and soft, the leading team has most work to do and should not be expected to pull the same load as the sledges coming behind, and if there are four or more sledges and the soft snow is very deep, the second sledge in line should also have its load reduced. A man going in front on skis or snow-shoes can only break a trail for the dogs and not for

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the sledge runners. As all our man and dog food was packed in boxes weighing about 50 lbs. each, altering the loads was an easy matter, but good judgment is necessary in deciding how much to alter them. Above all, a leader must remember that dogs well fed and well managed will be keen to work and will be willing to go on long after they should stop; while dogs well fed and badly managed will be keen to go on working until they suddenly appear to lose condition in a few nights, and then become terribly lethargic and difficult to drive. This was Stephenson's fourth winter spent in the polar regions handling sledge dogs, and as he is naturally a dog lover he understood them well.

Bingham and I proposed to hurry back the 90 miles to the Base. We found a level, uncrevassed place large enough to use as a landing-ground for the aeroplane at the end of the shelf-ice where we had left the others, so that while the dogs were being rested and fed up on seal meat Hampton could try to fly to this point a depôt of provisions large enough to last us for eight weeks. Bingham and I would then start south again, pick up the depôt and continue our interrupted journey behind Charcot Island to the end of the Dependencies.

We were ready to start back to the Base on September 24th. We had left a depôt at our turning-point, 700 feet above sea-level, of all the things which we could possibly leave behind, to be picked up when we returned. These included the wireless set for time signals, two boxes of spares, and a small amount of man and dog food which Stephenson would not require.

It was overcast when we left in the morning, and soon started to blow from the east and to snow heavily. Bingham was driving the front team and he steered by the compass for some time, but eventually, after covering 9 miles, he got amongst crevasses and had to stop until the weather cleared. The next day, although it was still overcast, the snow had stopped and a good run of $17\frac{1}{2}$ miles put us back at our old camp on the sea-ice. I, unfortunately, developed an attack of snow-blindness during the afternoon, for I had left my salvoc yellow glasses off while looking for the best way through the crevassed area at the edge of the

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shelf-ice. There had been really *no* need for me to take them off, and the snow-blindness was entirely my own fault. This was the only attack of the kind which we had on the expedition, thanks to the excellent quality of our snow-goggles.

From the camp on the sea-ice we went the 20 miles to Terra Firma in one day, but we were held up there for half a day by a strong east wind. The wind stopped during the morning and we got away after lunch, intending to travel late. When the sun set the moon was up, and we travelled on by its light. The temperature fell when the sun went down, but we pulled on large-size moccasins over our seal-skin boots, and these kept our feet warm while we were sitting on the sledges; in fact, these, combined with our Mackinaw coats, allowed us to travel in comparative comfort, even when crossing the mouth of Windy Valley, where the usual east wind was raising a low drift.

The moonlight failed about 8.30 when, as we were sledging over rough pack-ice, we were forced to stop until daylight. We had done $13\frac{1}{4}$ miles since leaving Terra Firma, and had about 29 left to complete the journey back to the Base.

We made an early start in the morning and found the surface to be hard wind-swept snow all the way, which enabled us to reach the Base about 5 o'clock in the afternoon.

A journey like this well illustrates how dependent a sledging party is on weather and snow surfaces, for if we had had these conditions a week earlier both parties would have continued south. We discovered later that one journey would have been completely wasted, so that the weather had really done us a good turn, although at the time we were very disappointed to have to return home.

Before we had left the Base on this last journey, it had been decided that Hampton should carry out, in our absence, some of the aerial survey, taking either Meiklejohn or Moore to work the camera. When Bingham and I returned the plane was all ready for these flights, and therefore there was nothing to delay flying the *depôt* south; in fact, we could start as soon as the weather would permit. The kind of flying

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we were about to undertake did not require the perfect weather which is necessary for aerial photographs and reconnoitring flights, when everything depends on visibility, for we were going to fly to a known point about 90 miles down the coast, and would not have more than a passing interest in the distant scenery. All the same, reasonably fine weather is required for any flying in the Antarctic.

We estimated that our next sledging journey would last about eleven weeks. We thought that the sea-ice in Marguerite Bay would probably be safe for our return until the middle of January, but it would be safer for us to reckon on getting back in the early part of the month. This plan would allow less than three weeks to carry out the eight or nine flights which would be necessary before Hampton had flown all our eight weeks' provisions to the dépôt.

The day after we returned—September 30th—was too windy and overcast for flying, but we had a busy time in putting away and drying out tents and camping equipment.

October 1st was still overcast, but we thought it good enough to make the first flight. On this occasion I was to fly with Hampton to show him where we wanted the dépôt laid. We took off at about 11.30 and were soon over Marguerite Bay, but there was still a good deal of wind about and we had a bumpy trip. When we passed Terra Firma and got a view of the shelf-ice edge about 20 miles ahead, we were disappointed to see that the clouds were lying right down to within a few hundred feet of the surface, so that there was nothing for it but to turn back. As the east wind blew hard that night we thought there was likely to be little chance of flying the next day, but the wind died down during the morning and Hampton and I took off soon after lunch. This time, after we rounded Red Rock Ridge, we found that the wind was still blowing hard off the mainland. However, we decided to continue, for finding wind here did not necessarily mean that it would be blowing 80 miles further on where we wanted to land. In fact, from checking our meteorological observations made during sledge journeys with those taken at the Base on the same day, and from the varying

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snow surfaces which we often found during the same day's travel, we knew that the east winds were very local.

As we approached Windy Valley we could see great clouds of snow being blown down it, while beneath us the drifting snow became denser until it blotted out the hummocks in the pack-ice. We were flying across the wind, so the little aeroplane was blown about a great deal, and looking down at the top of the drift gave us the strange impression that the whole surface was moving rapidly at right angles to our course. These rather unpleasant conditions persisted until we neared Terra Firma, where the wind gradually died away. When we passed Cape Berteaux we got into still air again, and experienced the satisfaction that one feels when flying out of a windy area into a calm one—a satisfaction similar to the exhilarating feeling of relief after bringing a small open boat from a stormy sea into a sheltered harbour.

We soon covered the remaining 20 miles to the southern end of the shelf-ice, and I pointed out to Hampton the spot where we wanted to land. The sun was shining on the snow, casting dark shadows where there was any unevenness in the surface, and we could see that the conditions were good for landing. After coming lower and circling round several times, to study the surface, Hampton flew over the spot where we proposed landing and dropped the two red flags which he always carried under the fuselage while flying on skis. The flag poles were weighted with lead and had steel spikes on their ends, so when they hit the snow they stood in a vertical position. By watching them from the plane Hampton could get a good idea of the wind force and direction, and also had good marks for judging his height if it were necessary to land on an overcast day. On this occasion he made a good landing on what we found to be soft snow under a breakable crust. We soon unloaded the one ration box and two-gallon tin of paraffin which we had brought with us. We had not brought more, as it had been advisable to land the first time with the aeroplane lightly loaded.

While we were circling the landing-ground we thought we saw the sledge track left by Stephenson's party winding up a glacier ahead of

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us and disappearing over one of the passes between the mountain-tops. So when we were ready to start once more we flew off to try to find out how the sledgers were getting on. We picked up their track near the bottom of the glacier and followed it up on to the plateau, then across the plateau for some 30 miles until it began to drop steeply down a crevassed glacier into the sound. Here lack of petrol—we had not come with full tanks on account of the extra weight—forced us to turn back, but not before we had discovered that Stephenson was well on his way south. I had also been able to study the route, which would be useful when Bingham and I returned. We could see a great many crevasses, but these were mostly in definite groups. With a sketch-map made from the air these groups could, to a great extent, be avoided when sledging, but if they were seen for the first time by a sledge party working at ground-level, hours or even precious days might be wasted trying to find a route through them.

On the way home we found the strong east wind still blowing between Terra Firma and Red Rock Ridge, but north of Red Rock Ridge we again got into still air and in a few minutes we landed at the Base.

Now that Hampton knew where we wanted the depôt there was no point in my being the one to fly with him. But it would be wise for someone to go in case he was forced down, when he would need help in tethering the plane. Besides, it is often necessary, when starting in deep, soft snow, for a man to pull on one wing tip while the throttle is opened, otherwise the plane is likely to bog and then the pilot cannot start it by himself. Riley was the lightest member of the expedition, so we decided that he should go with Hampton. If they got away early enough in the morning they would be able to make two flights in the day, and Riley could remain at the depôt while Hampton came back by himself for the second load. When Riley was left behind he would keep with him the tent belonging to the aeroplane emergency equipment, also a sleeping-bag and the necessary camping gear to allow him to remain there comfortably; he also had plenty of food and fuel in the depôt. Then if the weather looked threatening for the second flight

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we need not hesitate to leave him there until it improved. If all went well, and Hampton could fit in two flights in the day, Riley would return with him on the second one.

The night Hampton and I returned from the first depôt flight the usual east wind blew again, but it died during the morning, enabling Hampton and Riley to fly down in the afternoon. They got away too late to contemplate making two flights, but with the two men and equipment there was still room for 220 lbs. of dog food. They found the conditions in the air much the same as Hampton and I had experienced the day before, though there was not quite so much wind. While they were away Moore and I sledged the remainder of the provisions for the depôt out to the starting-place on the ice. Besides the stores we also took out eight gallons of petrol in four two-gallon tins, for if everything went very well, and we were lucky enough to get several more good days close together, we should then be able to leave this petrol at the depôt, which would considerably lengthen the range of the aeroplane, making it possible, as we thought at this time, for Hampton and me to carry out a flight as far as Charcot Island.

To our surprise, the morning of October 3rd dawned beautifully clear; this was the third consecutive day of possible flying weather we had had. The fliers made an early start, hoping to fit two trips into the day. About half an hour before we expected the aeroplane back, Moore, Bingham and I took my team, with a load of petrol and a fuel pump, out to the starting-point and waited there to refuel and load the plane. By about 1.30 we heard the hum of the engine, which could always be detected on a calm day before the plane could be seen. It soon appeared, flying low over the Base, and in a few minutes Hampton had landed and taxied up beside us. While we loaded up and refuelled he had a quick lunch and a drink of hot cocoa from a thermos flask. Then he flew off and was back again with Riley by 4.30. The aeroplane had covered some 360 miles in the day, and had left 600 lbs. of provisions on the shelf-ice, 90 miles away.

Flying operations were now held up by a week of bad weather, but

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the time was not wasted ; the engine was losing compression again and Hampton spent the time taking it down. He found a badly scored piston, so he changed it for one of the old ones which was not in such worn condition. This trouble with the aeroplane engine was a constant source of anxiety and seriously hampered our flying programme, for, although we could still make distance, she would seldom climb higher than 7000 feet, which made a flight over the high plateau of Graham Land impossible.

October 10th appeared a fairly good flying day, with a few low clouds hanging round the mountain-tops in the morning. If we could manage two trips we should have everything we needed at the southern depôt, including our eight weeks' sledging supplies, besides the petrol for the aeroplane and enough extra provisions of paraffin, man and dog food to form an emergency depôt in case Bingham and I were held up by open water on our return journey. Therefore Hampton and Riley got away without delay. While they were gone, heavy dark clouds started gathering over Adelaide Island and the mainland to the north and east, but we were relieved to see that they were only spreading out slowly over Marguerite Bay and keeping high enough to give Hampton plenty of room to fly underneath them. When he returned without Riley for the second load we debated whether he should start again, but as low cloud rather than strong wind worried us, the possibility of damaging the aeroplane was slight, for, if he was forced down, there were a great many good landing-places along the route, which he now knew perfectly. He could always, if he thought it advisable, tether the aeroplane at the depôt, and wait there with Riley until the weather improved. So, as the barometer was steady and the wind light, though from the north-east, he decided to start south again. The sky clouded over completely while he was gone, but the cloud layer remained at about 2000 feet, and both Hampton and Riley were safely back by 5.15 with their work completed.

Now it only remained for Hampton and me to carry out the long reconnoitring flight before Bingham and I could start off on our sledge

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journey. We considered this long flight advisable, for, as has already been explained, Stephenson and Hampton thought they had seen the southern limit of Alexander I Island, but in exploring the country as we had done so far, there were surprises round every corner, and I considered that every chance should be taken of reconnoitring with the aeroplane before any sledge party set out.

Hampton had taken the extra petrol tank out of the cabin while the loads were being carried to the depôt; he now spent a day fitting it back in place, and we were then ready for the flight.

We were held up by a week of bad weather, which we spent in preparing for the sledge journey and in getting fresh seal meat for the dogs. There were now plenty of Weddell seals lying about on the ice, mostly mothers with young ones a few weeks old. The females were in poor condition for the table, but provided an ample supply of good food for the dogs, while we ate the young seals ourselves. Their meat was light in colour, being similar to veal in appearance, but as tender as chicken, while their livers were a real delicacy. The longer we lived on seal meat the more we appreciated it as a staple food, for we found that even after two years we were still enjoying it.

October 19th was one of those perfect but not very frequent days which one gets in Graham Land—there was not a cloud in the sky; there was no wind, and the visibility was excellent.

Hampton and I were ready to start flying by 11.15, and when we rounded Red Rock Ridge and got out over the bay, the visibility came up to our best expectations. But the pale mistiness was present on the distant horizon, as always in these regions on sunny days, making a trap for the unwary explorer who may make too hasty decisions about distant land forms which he sees for the first time.

We hoped to fly over the route taken by Stephenson's party as far as the sound, but the engine was a little rough and refused to climb well; so flying at about 2000 feet we went round the longer way by the mouth of the sound. The engine soon recovered and we droned pleasantly along in the still air, free for once from bumps, with that feeling of

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something powerful holding one in space, and not realizing the speed we were travelling at unless we looked down at the tiny shadow aeroplane rushing along over the ice.

To the casual reader it may seem unwise to undertake a long flight with the engine in poor condition, but it must be remembered that the greater part of the flight was over shelf-ice where we could always make a safe forced landing, and as we carried camp equipment and snow-shoes, besides food and fuel for a month, walking home would be no more difficult than an ordinary sledge journey.

As we approached the mouth of the sound the ice became broken and thin; then, immediately off the entrance and running north along the Alexander I Island coast, there was a large extent of completely open water several miles wide. By getting in close to the shore of Graham Land we avoided this, and were always within possible gliding distance of more solid ice in one of the bays. In a few minutes we were over the shelf-ice itself. I had the survey camera with me and started photographing the west side, intending to do the east side on the way back. We were soon approaching the point which Stephenson and Hampton thought marked the southern limit of Alexander I Island, and were surprised, on drawing level with it, to see another point a little further on, and the sound still continuing to the south. On reaching this point there was yet another. We continued down the sound, flying closer to the west side than the east. We could therefore get a good view of the Graham Land coast stretching away until it disappeared into the distant haze, but we could not see any great length down the Alexander I Island side. We flew on southwards until we were some 120 miles from the mouth of the sound, then shortage of petrol made us think about turning. We flew diagonally across to the east side so that we could get a better view of the west side further south, and were surprised to find that it continued as far as we could see. We were now at the limit of our safety allowance of petrol, so were forced to turn back. We flew north once more, and as the aeroplane engine was now running satisfactorily we were able to follow the sledge route over the col and soon

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landed safely at the depôt on the shelf-ice. After stopping here for a short time to rest and stretch our legs after the cramped quarters in the aeroplane, we continued on the last 90 miles back to the Base.

We had of course got nowhere near Charcot Island, but we had made the surprising and interesting discovery that the straits continued in a southerly direction. This discovery, together with the fact that we had seen no possible sledge route leading from the west side of the sound across Alexander I Island, completely upset Bingham's and my plans for a journey to the west. We had seen enough of the sound to realize that if we attempted such a journey we should only be duplicating Stephenson's route for the greater part of the distance. It was therefore essential for us to time our departure with the object of meeting Stephenson's party somewhere on the Base side of the sound, either by the depôt on the shelf-ice or else on the sledge route over the promontory. We could then find out from him how the land continued beyond the point we had flown to in the aeroplane, and base the plans for our journey on the information he gave us.

CHAPTER ELEVEN

THE FINAL SLEDGE JOURNEY

BINGHAM and I were now keen to get started, as there was nothing further to keep us at the Base. The dogs were in good condition, for since our return they had been having mild exercise and plenty of fresh seal meat; and all our plans were thought out in case we were held up on our return by open water in Marguerite Bay.

Hampton and Riley were going to leave with us and bring provisions to the depôt at Terra Firma for Stephenson's party to use on their way home. While at Terra Firma they would mark out a landing-ground, so that the aeroplane could leave a large depôt there in case we were held up on our return by open water north of these islands. After this was done the people at the Base would also lay a depôt on the Refuge Islands, in case the bay-ice were broken back as far as Red Rock Ridge and we were held up there until we could be fetched in the *Stella*. Red Rock Ridge was where we expected most trouble, for the ice had been broken out as far as this when we made our first reconnoitring flight from the north of Marguerite Bay the summer before.

Hampton and I from the aeroplane had explored the possibilities of travelling overland from the south side of the ridge to the Base, and had found a possible sledge route down into Neny Fjord, but as this fjord was subject to strong gales we thought it possible that the ice in it would break up almost as soon as that round the point itself. We still had the canvas sledge boat which Ryder had made at the Argentine Islands, but this was likely to be of little use to us, for the spring-ice conditions would be quite different from those experienced in corresponding latitudes in the Arctic, where the hot summer causes a quick break-up, and the shore leads are comparatively free from mushy ice. But here on the south-west Graham Land coast, where the summer temperature

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averages somewhere about freezing-point, there is a long period while the ice is slowly rotting away when neither sledging nor boat work is possible, except perhaps by Eskimo kayak, which only one or two of us were experienced enough to use. Our safety, therefore, lay in a good system of depôts.

We were ready to start the journey on October 22nd, but were held up by the usual gales for four days. The morning of October 26th, however, dawned bright and clear and we were away by 11.20—Bingham and myself driving our two teams of ten dogs each, and Hampton and Riley with the bitch team.

As we approached Red Rock Ridge we were surprised and rather worried to see a large number of penguins congregating on the low rocks forming its end, and as we drove on among the off-lying islands several more appeared, apparently walking in from the open sea, which must have been at least 70 miles away. For penguins to come all this way over the ice is not so extraordinary as it sounds. There were many large bergs frozen into the bay, and these, continually being moved by wind and currents, rub against the surrounding ice edge so that in the spring, when the sun's warmth begins to have a slight thawing effect at midday, the ice round the bergs crumbles away, leaving a crack a few feet wide which gives the penguins a chance of getting back into the water. Even if they do have to walk long distances, penguins are well adapted for travelling over the ice. They do not go along with an ungainly waddle as one is accustomed to see them progress in the Zoo. They more often toboggan on their breasts, using both their flippers and legs for pushing themselves along, and only standing up to scramble over an ice-hummock or when they want to have a general look round or gossip to an acquaintance. Sliding over the ice in this way, they can go for long distances as fast or faster than a man can walk.

In spite of the excitement which they caused among our dogs, we soon rounded Red Rock Ridge and camped on the Refuge Islands at 4.30.

October 27th.—We were up at 6 and made a good start, hoping to do the 30 miles to Terra Firma in the day. Hampton's bitch team

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had a load equal to ours, with the addition of an extra man skiing behind, so we expected soon to pull ahead of them. As we drove off the island we waved good-bye, saying, "See you in January," but on looking round in a few minutes' time I saw that 'the girls' were only about 100 yards behind, pulling along in great style with their tails up and waving, and their pink tongues hanging out only a few inches above the snow. Every time we looked round they were still holding their own, and in fact in the evening when we reached Terra Firma they were in camp as soon as we were, tired but very pleased with themselves and obviously realizing that they had done something clever.

October 28th.—We spent the day in camp on the sea-ice in a bay on the north side of Terra Firma, as it had been blowing hard with drifting and falling snow.

October 29th.—Still in camp. It blew hard all night and has been blowing from the west and snowing all day. There is a big spring tide at present which must have caused the ice to rest on a rock, for just after breakfast there was a loud report and a shudder ran under the tent. On investigating we found a series of cracks radiating from a point about half-way between our tents.

October 30th.—The snow stopped about 11 o'clock and we got away at 1. Hampton and Riley came with us for the first $2\frac{1}{2}$ miles to a stretch of level ice just south of the islands, where they wanted to flag a landing-ground for the aeroplane, so that it could fly down with supplies for the depôt which was to be left here. When we got away from the islands we encountered a heavy surface and camped at 6 o'clock after having done $6\frac{1}{2}$ miles.

October 31st.—It was blowing from the north-east with a low drift when we started today. The sky gradually clouded over, and at about 3 o'clock snow began to fall heavily. We were by this time close up against the northern edge of the shelf-ice, and as there was no visibility we were forced to stop. We camped, as near as we could tell, in much the same place as we had been in six weeks before, when in company with Stephenson's party. The problems were much the same, only this

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time, after having once seen the broken-up state of the shelf-ice, we realized more strongly than before the necessity of moderately good visibility for getting across it.

November 1st to 5th.—During these five days the wind remained in the north-west, bringing down heavy low clouds and snow-storms. We could only sit in the tent and watch the weather, and if it showed any signs of clearing slightly, be ready to pack up hurriedly and possibly move on a few miles. At 3 o'clock in the morning of the 5th there was a definite break in the clouds. We got an early start and succeeded in reaching the aeroplane depôt after a run of $17\frac{1}{2}$ miles over a surface which had been improved by the wind the night before. It was snowing with an easterly wind for the last part of the day, causing us to get off our course, but after some wandering about we located the flags marking the depôt, which had been practically buried in the snow.

The sky cleared about midday the next day, but we only did $1\frac{1}{2}$ miles before the snow came down as hard as ever. —We were now right at the foot of the mountains, but we believed rather too far to the right of our proper course, which led up through the crevassed lower slopes to the place 700 feet above, where we had depôté everything that we could leave behind when we separated from Stephenson's party.

The snow fell continuously all the 7th and the morning of the 8th in large cotton-wool flakes which piled up round the tent and sledges as we watched them, and lay on the ground in a soft feathery layer gradually growing inch by inch, making even ski-ing heavy work. We lay on our sleeping-bags listening to the gentle hiss of the miniature avalanches as the snow slid down the outside walls of our tent.

High winds unaccompanied by falling snow can be overcome by the polar traveller, and low temperatures should not worry him. But to my mind there is nothing more depressing and demoralizing than day after day of heavy snow falling through still air with a temperature just below freezing, which is high enough to allow the flakes to melt when they touch any dark object or even the light-coloured wood of the ration boxes. On such days the visibility is only a few yards when looking at

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some object darker than the snow, but on looking at the snow-covered landscape there is none at all, which makes travelling in country known to be crevassed foolhardy. Even when the snow stops, sledging is painfully slow, with the dogs floundering up to their bellies while the men on their skis or snow-shoes have to heave and tug at the heavily laden sledges, which seem to acquire the exasperating knack of digging themselves deeply in the snow. On these occasions snow-shoes are, in my opinion, very much better than skis. I, personally, take both skis and snow-shoes on a long journey, and use the snow-shoes for making and breaking camp when the snow is soft and one has to walk about in confined spaces. Also I prefer them to skis when it is necessary to manhandle the sledges up steep slopes or through deep snow.

On the afternoon of November 8th the snow stopped but the mist remained. However, the visibility was good enough to distinguish the slightly concave snow-bridges over crevasses; sometimes only recognizable by a slight change of colour on the snow surface which cannot be seen unless one looks well out to one side of the line of travel.

I set off on skis to try to find the upper dépôt. I took what I believed to be the general line, and after wandering through the snow for about $1\frac{1}{2}$ hours I recognized two large crevasses, and in another hour I at last found the dépôt. It was completely buried, and only about 2 inches of the top of the flag pole was showing above the new snow. After replanting the flag I started back, making a double track which would help the dogs. About half-way down I met Bingham coming up. I had been well over the time-limit which we had fixed for my return, so, equipped with rope and ice-axe, he had set out to follow my tracks in case I had fallen down a crevasse—a possible but not likely thing to happen.

We returned to camp together, harnessed our dogs, and started off over our tracks with half-loads, leaving the camp standing at the bottom of the hill. The distance from the camp to the dépôt 700 feet above was only 1.6 miles, but so deep and soft was the snow that we did not get back to the tent until midnight. It snowed again in the night, but

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the temperature went down to 20° of frost, giving our tracks a chance to harden, which meant that when we started in the morning we were able to reach the upper depôt with the other half of our load in 1 hour 20 minutes. Soon after we arrived the snow came down as hard as ever and continued all through the next day—November 10th. But we had everything at this upper depôt, and as there was more food than we could take on we did not mind the wasted day.

The next morning, up where we were camped was bright and sunny, but a few hundred feet below, a thick fog enveloped the shelf-ice and the lower reaches of the glaciers flowing into it. We set off with less than half-loads to break a trail to the top of the pass. I went ahead on skis, while Bingham drove both teams; his magnificent team—very much the strongest we had—was able to follow my trail without difficulty, leaving him free to drive my team behind. As we got higher the surface gradually improved, becoming more wind-swept.

After covering $7\frac{1}{2}$ miles we reached the top of the pass, and as we came over the last ridge we saw three black specks silhouetted against the skyline several miles away. They disappeared into a hollow, and when they reappeared on a nearer ridge and turned slightly broadside to us, we could distinguish three separate teams with a man behind each, so we knew that all was well, and neither men nor sledges could have met with any serious accident. We altered our course slightly and headed straight for them. They soon drew near with Bertram's team in the lead; Lamb, his sturdy little bitch leader and, incidentally, mother of some of our best dogs, was stepping out in front with her head and tail up as though she fully realized the importance of her position. The men and dogs all looked thin, but very fit. After exchanging greetings we did not linger long, as a cold wind was beginning to blow. Bingham and I depôted our loads, then taking some of the others' equipment on to our now empty sledges, we all drove back down the trail to our camp 2300 feet below.

As soon as Stephenson, Fleming and Bertram had their tents up, Stephenson got out his map and gave us a description of their work,

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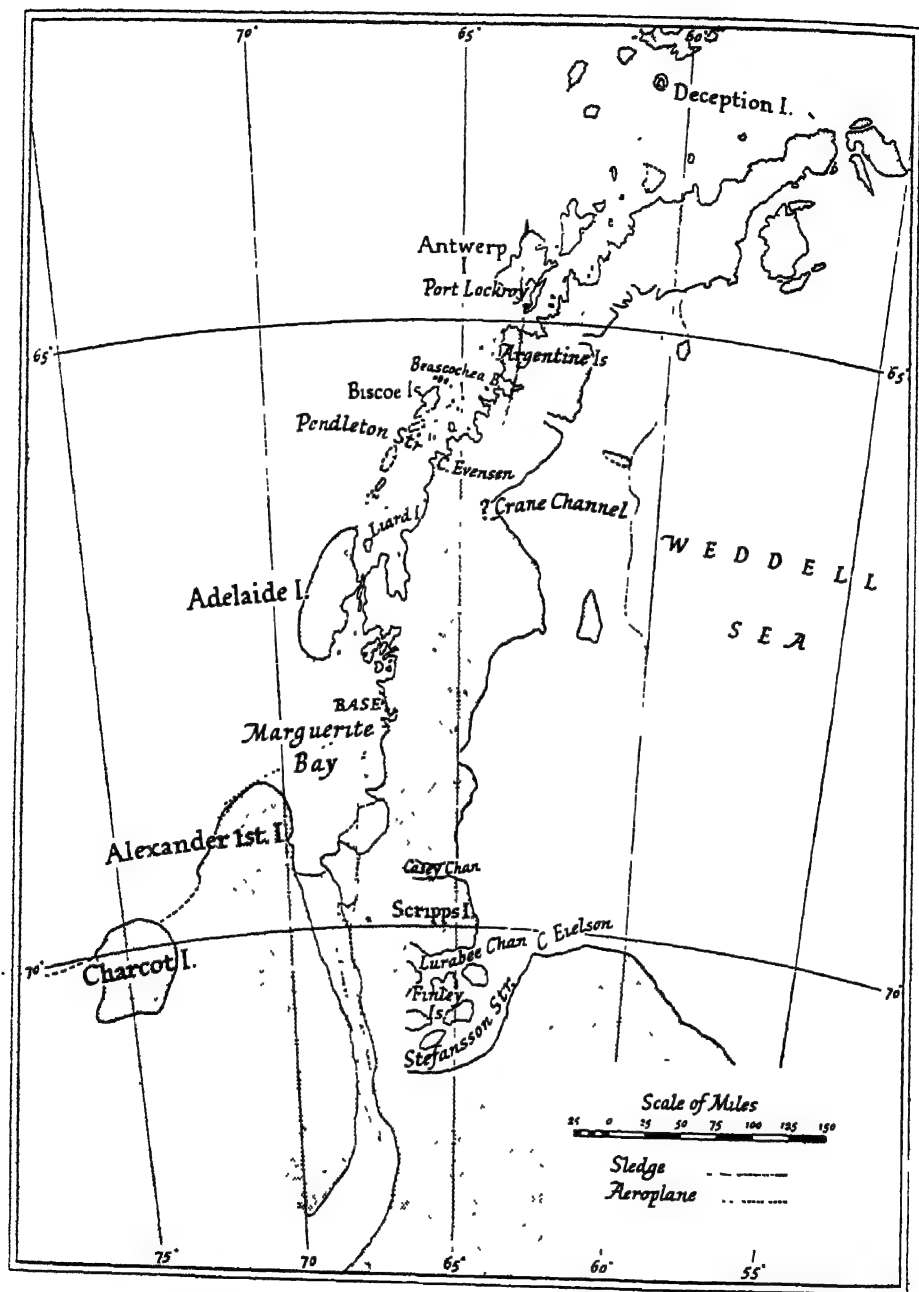
which is described in Chapter Nine. Their journey was a difficult one and a fine effort. They had started very early in the spring and had had to combat bad weather and, for a considerable part of the journey, deep snow and badly crevassed country. In spite of these handicaps they would, by the time they returned to the Base, have sledged 600 miles and explored a vast area of hitherto completely unknown country.

We spent a very happy evening exchanging news and studying the new map; then Bingham and I discussed our own plans. Stephenson told us that there was no practical route to the west over Alexander I Island, and there was obviously no point in our travelling south as we would only be duplicating their journey. So we decided to try to make the first crossing of Graham Land and see if we could explore some of its east coast.

From our camp we could see a rift in the plateau which from a previous view from the aeroplane appeared to extend far into the interior, and from this rift a large glacier flowed into the east side of the Wordie Shelf-Ice, but, as is generally the case with the larger glaciers, this one was badly crevassed and was therefore to be avoided if possible. But when Hampton and I had been following the sledge tracks of Stephenson's party through the mountains while flying on October 2nd, we had seen what appeared a possible way to the east. This route followed Stephenson's sledge trail for some miles from the south edge of the shelf-ice and then turned eastwards, crossing the plateau south of the rift.

The next day, November 12th, started fine, but the remains of the fog still hung about over the shelf-ice. We said good-bye to Stephenson, Fleming and Bertram, then, while they rode on their light sledges down the steep slopes, we started off over our track of yesterday. After picking up the loads that we had left at the top of the pass we went on over Stephenson's trail for about $3\frac{1}{2}$ miles before camping beside a hill rising to a further 600 or 700 feet above us. The top of this should afford a good view over the country to the east.

November 13th.—A sunny day with no wind. As soon as we had



Graham Land as it appeared after the Southern
Sledge Journey

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finished breakfast I climbed the hill on skis while Bingham packed up the camp. After the usual disappointment of first reaching a false summit, I eventually got to the top and had a magnificent view over the beginning of the country which we wished to traverse. To the north and north-east the high mountains of Graham Land stopped abruptly at the rift, which, as far as could be seen from this point, was dotted with a few rock nunataks. On the south side of the rift the mountains rose again in the form of rocky ridges running east and west and reaching a height of about 8000 feet. The south slopes of these ridges were completely glaciated and merged with the ice-plateau which covers this part of Graham Land. The plateau starts to the south of the Wordie Shelf-Ice at a height of 3000 feet, and gradually rises until it reaches a height of about 7500 feet, some 80 miles further east. From the top of the hill I could see it rising in a series of wave-like ridges until my view was cut off by a long ice-spur about 20 or 30 miles away, running out from the mountains which fringe the south side of the rift. The top of the waves appeared to be about 2 miles apart, and the valleys between about 100 to 150 feet deep. There were several dome-shaped ice-covered nunataks standing up above the plateau, while away to the south-west I could see what appeared to be breaks in the higher part of the plateau which finished in cliffed edges on the two sides visible to me, namely the north-west and west.

I had an exhilarating ski run back to camp and arrived just as Bingham was finishing lashing up the sledges. We went down Stephenson's trail for another 4 miles and then turned on a bearing of 114° true which should carry us to the southern end of the glaciated spur which I had seen ahead. After covering 10 miles we camped early at 4.30 to rest the dogs after their long climb through the deep snow.

November 14th.—A day spent in camp with a strong wind from the north-east accompanied by snow.

November 15th.—The north-east wind was still blowing strongly this morning, but the snow had stopped falling so we were able to travel in spite of the low drift. We started with full loads; the surface was very

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heavy and soft, making it impossible for the dogs to move the sledges up the steep slopes. We unlashd and took off half our loads, carrying the other half on for 3 miles. We then made camp before returning for the boxes which we had left behind. After picking them up we returned over our trail to the camp and then pushed on with these second loads for another 1·7 miles.

November 16th.—It has been a fine day with no wind. We have been climbing steadily for the last few days, so had a grand view looking back towards the mass of Alexander I Island. We were far enough away to get an uninterrupted view of its main eastern range bordering the new sound, and could truly appreciate the sight of the great rock wall terminating in snowy peaks rising to 8000 feet.

We soon reached and picked up the *depôt* which we had left yesterday. The surface was still terribly soft. I tried going ahead on skis while Bingham drove both teams, but the surface was too bad for the leading team to go far without stopping. At the lunch-halt we talked over another plan; we thought that the following team working in the track of the leading one could manage its full load, so we decided that Bingham should leave half his load and break the trail with a light sledge while I came along behind with my full load. Then when we stopped in the evening I would get the tent up and the camp arranged while Bingham went back for the rest of his load. This system worked well, and we succeeded in covering 6·6 miles.

November 17th.—The morning was foggy with ice-crystals falling. Bingham started with a half-load, while I brought along my complete one. After travelling for $1\frac{3}{4}$ hours we had covered 4·1 miles when, as the sky looked very stormy and snow was beginning to fall, we considered that we were getting too far from the small *depôt* which we had left behind. We stopped with the idea of putting up the tent, and then if the weather were not too bad, and if Bingham returned with the other part of his load in good time, we would leave the tent up and push on with half-loads.

During this period of the journey, when we were relaying in almost

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continual bad weather, the man who drove back for the second load would take with him our 'pup tent' (which is a small spare tent weighing about 10 lbs.), his sleeping-bag and deerskin. Then if he failed to find the camp he could stay comfortably in his own tent until the visibility improved. Although we were always prepared for this emergency we never had to use the pup tent, owing mainly to the excellent method of navigating with an Air Ministry pattern P 4 compass, fastened to the sledge and used in conjunction with a sledge-wheel reading in miles and tenths. The P 4 is a dead-beat compass designed for the fighting aeroplane, and is so steady that even when the sledge is travelling over rough country it will hold a good course. The sledge loads vary so much, especially when relaying, that it is impracticable to swing the compass properly. But this does not matter, as its main use is for keeping on a straight course which has been found by sighting along the sledge with a prismatic compass.

On this occasion, by the time Bingham had picked up the second half of his load there was a strong north-east wind driving the falling snow into his face in large wet blobs which made it practically impossible for him to keep his eyes open when facing into it. He set the compass on the correct bearing and started to drive back the 4 miles to camp. The visibility was nil and there was by this time no sign of our trail. While he was returning I finished pitching the camp and then waited outside in case I heard him shout to his dogs, for he would not find the tent unless he happened to steer straight on to it. I at last heard him shout some distance off to the north, and fortunately up-wind. By steering a course with a prismatic compass I was able to connect with him and lead him the last few hundred yards to camp.

November 18th.—Impossible to travel today as the north-east wind is still blowing at gale force and there is heavy snow falling.

November 19th.—Still relaying, but today I went back for the second load while Bingham put up the camp. We managed to make good 6 miles, but it meant working late and I did not get back with the second load until 9 o'clock. We altered our course slightly this morning

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to avoid the tail of the ice-ridge which I had seen from the top of the hill by our first camp on the plateau.

November 20th.—The snow was falling heavily this morning with no visibility, and as the country in front of us appears much more broken we decided not to travel. But during the afternoon the snow gave place to fog, which was thin enough to give us a definite horizon at about 50 yards' radius where the snow merged with the lighter-coloured fog, forming a distinct line which gives one a good enough idea of the gradient immediately ahead. We left the camp standing and went forward with half-loads for 3 miles until the fog became denser, completely blotting out any kind of horizon.

November 21st.—A glorious sunny day. We still relayed, but managed to cover 8·2 miles. During the afternoon we ran off the soft snow surface on to much harder wind-swept snow which should make it possible to carry on tomorrow with full loads.

We have passed over much more hilly country today, in fact it appears that we are crossing a mountain range struggling for existence underneath the ice. All the hills are completely ice-covered, with steep slopes about 400 feet high.

When we topped the last ridge, just before camping, at an altitude of about 6000 feet, we saw ahead what we took to be the first of the east coast mountains—a high rocky pyramid-like peak which must be higher than anything else in the range, for it is the only one which we can see.

November 22nd.—The usual fog this morning, or rather cloud, as we must be well up in the clouds at our present altitude. However, we had about a 50 or 60 yard horizon and were able to travel. The surface was much improved, and in spite of the fact that we were still climbing, the dogs went along well with full loads, and by the time we camped had covered 14·4 miles. Soon after dinner Bingham looked out of the tent and said that he believed the fog was clearing. We had of course seen nothing of the new mountains all day, so we waited impatiently for a few minutes, then the fog suddenly lifted, revealing a whole range

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ahead. There was another snow-ridge about a mile in front which blocked our view of anything except the tops of the larger peaks, so I skied ahead armed with notebook and compass to take full advantage of what might be only a few hours of clear visibility. When I reached the top of the ridge I got an uninterrupted view of the complete mountains silhouetted against the evening light, which still sparkled on their glaciers and ice-falls. Our present course, almost due east, was leading us straight to what appeared to be the only low pass, and we could not do better than continue on it.

From this same point I could get a good view to the north, for the low range of hills bordering the south side of the rift here petered out, giving me a chance to see down into the rift itself. It appeared to be about 800 feet below us, which made it approximately 5400 feet high at this point, but both it and the plateau which we were on rose considerably to the mountains in front. While at the point where the rift met the mountains, the range, though considerably lower, carried on right across it and connected with the peaks on the north side.

November 23rd.—We have been travelling through cloud or fog all day and have not been able to see anything at all; in fact, by 4.30 our little horizon had faded right out, and we were forced to camp, having done 14 miles.

November 24th.—The morning started foggy but cleared about lunch-time, and we saw that we were nearly in the mountains. We were still steering a good course for the pass which we have been making for for some days, and at 3.30 we pitched our highest camp at 7500 feet, beside the peak which we had first seen (we were later to find that it rose to 9500 feet and was the highest mountain that we discovered in Graham Land). Bingham, who wished to rest his knee as much as possible, started making camp while I went off on skis to climb one of the lower peaks ahead.

I was expecting, on reaching the top, to look out over the shelf-ice bordering the Weddell Sea, for these mountains which we had now reached corresponded in longitude with the east coast of Graham

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Land—or rather Scripps Island—as plotted after Wilkins's flight in 1928.

Leaving my skis at the top of the last snow-slope I scrambled up the remaining few hundred feet of rock. On reaching the top and looking out to the east I was surprised to see, not the shelf-ice which we expected but another plateau, about 500 feet lower than the one on which we had been travelling, stretching away to the east for at least 20 or 30 miles, and in the far distance more mountains, while on the plateau itself I could see one nunatak with a rocky top rising to about 500 feet. The only possible way down to this lower plateau appeared to be a steep but uncrevassed slope about a mile to the south of our camp. After taking some bearings I returned to my skis and had a glorious run back to the tent.

Coming back to camp, especially in bad weather, one has the feeling of coming to a comfortable home, for, although the camp is moved on every travelling day and the surrounding scenery therefore changes, the arrangement of the tent and position of the dog teams is always the same, and this gives it a feeling of familiarity. The contrast of climbing a virgin peak, often in a biting wind, and looking out over unexplored country, and then returning to the warm tent to think over and discuss the unknown future, is one that always appeals.

November 25th.—Blowing a gale from the north with heavy falling snow all the morning and most of the afternoon. The snow stopped in the late afternoon and the wind slackened considerably. As there only appears to be one way through the mountains we shall probably have to come back by this route, so we have decided to leave a depôt here. We took two boxes of dog pemmican and a tin with a little paraffin in it up to the first rock exposure, and buried them in the snow just at the foot of the rocks. This depôt is clearly marked with a flag, and should be easily found.

November 26th.—A day of brilliant sunshine and no wind. We found our way down on to the lower plateau easily enough, and our aneroid showed the drop to be 700 feet. Once on the lower plateau, we headed

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due east straight across it, and about lunch-time passed the isolated nunatak. The surface was wind-swept and hard, enabling the dogs to trot along nicely. By camping-time we had done 22·8 miles and had reached the mountains bordering the east side of the plateau. I climbed one of them and this time looked out on to what I felt sure must be the shelf-ice of the Weddell Sea, but I could not really tell for I was looking down on to the top of a thin cloud layer far below. From where I stood the mountains fell away in a series of rocky ridges intersected by steep glaciers which eventually disappeared into the cloud about 8 miles further on and a few thousand feet below. Most of the glaciers spilling over the rim of the plateau were badly crevassed, but I could see one about a mile and a half to the north which looked uncrevassed and quite possible.

November 27th.—A day of fair visibility, but we did not get far, only 7·7 miles, as we spent a lot of time twisting and turning in the broken country; also I climbed two hills, and from the second one could see what I took for the beginning of the shelf-ice. The low cloud had rolled back about a mile and I could make out that the land ended in a vertical cliff with much crevassed shelf-ice below.

November 28th.—The day was fine and we decided to make it a 'survey day,' that is, we spent it in camp doing latitude, longitude and azimuth observations and getting a wireless time signal; also Bingham collected some rock specimens from the hills near by.

November 29th.—The day started badly with wind and falling snow, but it cleared about lunch-time, enabling us to start. We travelled eastwards down a fairly steep but uncrevassed glacier, then swung round to the south and headed for a glacier which from the top of the last hill we had climbed looked to be a possible way down on to the shelf-ice, though we had not been able to see its lower reaches as they were still shrouded by the fog.

We camped at 6 o'clock, having covered 8·1 miles. As soon as we stopped I climbed a hill near by and planned out a route for the next day.

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November 30th.—A fine day, but the low cloud still persists out over the shelf-ice. The surface was hard, wind-swept snow, but we went forward slowly with many checks until at 3.30, after covering 13.3 miles and having descended about 1700 feet since leaving the second plateau, we reached the edge of the glacier for which we have been heading. We soon got into bad crevasses and had to camp while we prospected for a possible way through. This proved difficult, so I eventually climbed a hill overlooking the glacier and from the top had a good view of the surrounding country, except to the east beyond what we took to be the coastal cliff edge, where the low cloud was still obscuring everything.

The glacier to the south completely blocked our progress unless we could cross it, as it flowed straight down from the plateau above until it disappeared into the cloud below. It was very badly crevassed for its whole length, and looking down on it I could see that many of the crevasses were open or only thinly bridged. As there were undulations in the surface they did not only run at right angles to the flow but were scattered haphazardly. In fact, getting across it seemed a forlorn hope. If we failed we should have to return to the plateau, then turn south and strike out to the coast again further on.

December 1st.—Foggy day spent lying up. We must have moderately good visibility for getting through the crevasses ahead. When Bingham was arranging camp last night he unfortunately slipped the cartilage in his weak knee and today it is very stiff, so being forced to spend the day lying up is probably a good thing.

December 2nd.—The day was fine and we got an early start into the crevasses. After trying to penetrate them for some five hours, we gave it up as hopeless, but not until we had both had several narrow escapes and Bingham's leading dog had been lost. He broke through a bridge and, biting out of his harness, disappeared into the darkness below. Another of Bingham's dogs fell into a crevasse and also came out of his harness, but he landed on a ledge about 30 feet down. The ledge looked very weak and we had to save him quickly. I put a running noose on the end of a climbing rope and dropped it over his head. It is

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interesting to note that, although he was a heavy dog, being dragged by the neck up the 30 feet had no ill effects.

The snow-bridges over the crevasses in this part of Graham Land are unlike anything Bingham or I have met before. The surface snow, which is hard and wind-swept, covers the crevasses with a lid of crusted snow only a few inches thick, which has a particularly solid look, as it is hardly concave at all and has none of the tiny cracks along the sides which are generally a sign of a weak bridge; but one tap with an ice-axe will go straight through. If one lies down and looks along the under side of the bridges they appear to have no stouter places where one might cross; so after exploring every possible route we were forced to return to our camping-place early in the afternoon. I spent the rest of the day surveying and collecting rock specimens, while Bingham rested his knee.

We will have to retrace our steps to the plateau and travel south by that route, for the low cloud still persists out to the east, making travel on the shelf-ice impossible.

December 3rd.—Bingham's team, which was much more powerful than mine, had been breaking the trail ever since we left the Base, but now that his leader has gone I drive mine in front. We got away at our usual time—about 9.30—and reached the plateau. This meant covering a distance of about 19 miles and climbing 1700 feet, which speaks well for my two pup leaders, especially as, for the last few miles, we had a strong head-wind with drifting snow. As we approached the final glacier which leads up on to the plateau, the clouds settled down and snow started falling as well as drifting. But since we had been coming back over our old route all day we had a good check on our compass traverse and knew that it was accurate. Therefore when the visibility failed we had no difficulty in navigating with the P 4 compass.

December 4th.—Today has been fine. We got away at 9.30 and did 20.1 miles by the time we camped at 5 o'clock. We were running practically due south for most of the day with the first range of mountains which we had seen on our right hand, and the more isolated peaks

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fringing the east side of the lower plateau on our left. The plateau itself is formed by a series of undulations lying east and west with here and there wide shallow gullies running out between the mountains on our left where the ice spills over the plateau edge in the form of ice-falls or crevassed glaciers. At the end of the day we started climbing up a steep slope which forms the southern boundary of the lower plateau, and which I think will bring us back to the same height as the plateau on the other side of the first mountains.

December 5th-6th.—Two days spent lying up. A strong east wind has been blowing, bringing up the cloud from the shelf-ice. The temperature has been 21° of frost, which is the coldest we have recorded since leaving Stephenson's party on the other side of Graham Land.

December 7th.—The weather cleared up at midday and we got under way after lunch, doing 6.3 miles over a surface which is much softer than the ones we have been getting for the last week. We have been travelling south and climbing steadily. When we camped tonight we were on top of a shoulder running out from the higher plateau, which has taken the place of the mountains to the west. This shoulder finishes in a small mountain group 6 or 7 miles due east of us, while in front a valley glacier runs east from the plateau. On the other side of the glacier far to the south there is a large mountain range with rocky cliffs and ridges in plain view.

December 8th-10th.—We have been lying up for these three days. On the 8th and 9th there was a strong east wind which blew the clouds up from the shelf-ice, and the combination of low clouds, falling snow and drift caused by the wind has made travelling impossible. On the 10th the wind swung to the south and blew the hardest gale which we have had since leaving the Base, but the snow kept on falling and it has been piled up in soft drifts and ridges.

December 11th.—The morning was a little better; the wind had stopped, but there was still a lot of cloud about. We could see nothing to the south, but the mountain group at the east end of the shoulder on which we were camped was showing up clearly and looked about 4 miles

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away. We decided to sledge out to it, for we thought that from the top of one of the mountains we could get a good view of the east coast. When we got out of the tent we were appalled at the condition of the surface. The new snow was blown up into ridges several feet high which were not crusted properly, and the sledges just dug straight into them and stopped dead in spite of the efforts of the dogs and the driver. Our loads were much lighter by this time, but after struggling along for a few hundred yards I dumped about half of mine and went ahead, breaking the trail with a very light sledge.

Soon after we started the east wind began again, bringing the low cloud up from the barrier in great waves, and snow began to fall heavily. However, we had the bearing of the mountains ahead so were able to push on. After covering 3 miles the ground in front suddenly began to rise steeply. We stopped, and after looking ahead for some minutes we could just distinguish the rocky top of one of the mountains almost above us. We immediately set about erecting the camp, and as soon as the tent was up I started back for the other part of my load. By this time the wind was reaching gale force, and the falling snow was most unpleasant—in fact, there was already no sign of our trail. I had the pup tent and my camping gear on the sledge, so could drive back on a compass course to the dump in complete safety. I kept a careful check on the sledge wheel, and just when it showed the required distance I caught sight of the flag which marked the dump only a few yards away. It was pure luck running on to it so easily, as I certainly expected to have to circle before finding it. When I started for camp again the wind was dead ahead, making it most unpleasant for the dogs. We luckily steered slightly up-wind of the tent, so Bingham, who was on the lookout, heard us and gave us a lead in.

Once the dogs were fed we crawled through the sleeve entrance of the tent and came out of the swirling snow and biting wind into the warmth and comfort of the well-appointed camp. We soon had our moccasins, duffles, inner and outer gloves and windproofs hung up in the peak of the tent to dry, while we in underclothes, flannel trousers

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and shirts lay back on our eiderdown sleeping-bags and discussed what we would have for dinner. Not that there was much choice, but it is always pleasant when one is really hungry to anticipate a meal by talking about it, and after all we might have our pemmican broth thick, thin or medium, according to how much pea-flour or dried potato the cook put in. As I was the surveyor and navigator of the party, we divided the camp work so that I always cooked breakfast and Bingham cooked dinner—this leaving me free in the evenings to work up the map which had been made during the day—a thing which it is very necessary to do while the country is still fresh in one's mind, especially when compass traversing as we were. But on such a day as this, when we had not done any surveying, after plotting our course and position according to dead reckoning I could lie back and read, or watch Bingham slowly stirring the pemmican. After dinner we would both write up our diaries and possibly read for a short time, then put out the stove and, taking our now practically dry clothes into our sleeping-bags, settle down for the night. We always tried to regulate our time so that we had eight hours in our sleeping-bags, which is essential for maintaining the health and efficiency of a party while on a long journey. So eight hours after we got into our sleeping-bags the alarm watch would go off, and after wondering for a few minutes if there really was very much point in ever getting up again and deciding that perhaps there was, I would open the top clips of my sleeping-bag and put one arm out, being careful not to disturb the hoarfrost which had formed on the walls of the tent over-night. Matches and methylated spirit had been left ready the night before, and after lighting the stove I had a good excuse for getting back into the comfortable sleeping-bag for about ten minutes while the tent warmed up and the hoarfrost melted. If one gets up before this, the hoarfrost will come down in showers, wetting the sleeping-bags and anything else that happens to be exposed. Once the frost had gone I would get out of my bag and collect some snow-blocks which had been put between the inner and outer covers of the tent the night before. These blocks were put in the pot and melted in

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preparation for porridge. When the ice was melted and I was about to put the oatmeal in, I would call Bingham, who had to spend some time fitting his knee-brace in place—a complicated business, for it included putting a broad belt round his waist, which he connected by two straps to the top of the harness, thereby stopping it from slipping down his leg. After the belt was in place he had to put a thick blanket pad over his knee to prevent chafing, and then the harness was fitted and held in place by four straps. To think out this harness in the first place, and then to wear it day after day on a long journey without complaining, is some indication of Bingham's amazingly stout heart.

After breakfast we would both finish dressing, and then, if it were a travelling day, pack up the camp, but if not we would wait in the tent, reading or doing odd repair jobs, but prepared to start if the weather showed any sign of clearing.

This particular morning, December 12th, was different, for we had reached a point where we should get a commanding view of the surrounding country, and we wished to stay camped until we had a chance to do some surveying. The morning was foggy, but soon after breakfast the fog began to show signs of dispersing, and by lunch-time it had cleared off the higher levels. I climbed a hill about a mile away which looked as if it would afford the best view, while Bingham climbed a nearer one to collect rock specimens. When I reached the top of my hill I could not see much, for the lower levels were still covered with cloud. However, I was able to get some angles to the mountain-tops lying to the south and south-east before returning to camp.

December 13th.—A busy day. We set the alarm to go off at intervals of two hours all through the night, and about 3 o'clock in the morning the weather showed signs of clearing. By 4 o'clock all the low cloud to the south had cleared away, so I started off for the top of the mountain which I had climbed yesterday, this time taking the theodolite with me. When I got to the top the visibility was excellent, with only the usual low cloud out over the shelf-ice. From where I stood (lat. $70^{\circ} 11' S.$, long. $63^{\circ} 54' W.$) I had an uninterrupted view to the

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south and east. Out to the east the coast continued running in a north-south direction, while beyond it, showing vaguely through the cloud, was what might be low land on the other side of a fjord or else just dark patches in the top of the cloud layer. Immediately south of us was a depression about 30 miles broad which ran out to the coast in a series of glaciers divided by low hills, mostly glaciated, but a few with some rock exposed. The glaciers were crevassed, and about 15 miles to the south-west of our camp they joined together in a trough-like valley which rose in moderately steep slopes until it merged with the plateau. The plateau, especially on the west and north sides of the trough, was broken up by nunataks in the form of either isolated hills or small mountain groups. On the south side of the valley the land rose again to form the highest mountain range which we had yet seen in Graham Land. We later established the height of the peaks at something over 10,000 feet, but we could not get a long enough base for measuring them with any degree of accuracy, so our estimated height is unreliable. The north face of this range finished in sheer cliffs reminiscent of the Alexander I Island coast at the entrance to the sound, but in this case they appeared to be more broken up by broad glaciers.

After taking a round of theodolite angles I climbed to another position to the east of the camp, where I was able to get more theodolite angles to some of the same points. After finishing at this station I skied back to camp, arriving at 11 o'clock. Bingham had breakfast prepared, and after a hurried meal we took a sun observation for latitude, then Bingham went off photographing and collecting rock specimens, while I stayed in camp to finish the astronomical work and get a time signal.

When Bingham was collecting rocks from the top of a hill behind the tent he noticed that the cloud over the shelf-ice had receded to the east, enabling him to see what he took to be a low cape about 20 or 30 miles to the south. He had no survey instruments with him, so hurried back to the tent. As soon as he got back I immediately went up the hill, but by the time I got to the top the clouds had come back to the edge of the coast again and I could see nothing of Bingham's cape.

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In the evening we had to decide on our future plans. We only had enough food to let us travel away from the depôt, which we had left at the pass in the first mountains, for another four days. This would not be long enough for us to do any useful work to the south, because we could not possibly get further through the mountains ahead than the range of our present survey, so we decided to retrace our steps to our last camp, and then strike up to the north to see if we could explore the eastern end of the rift which had been on our left all the way across Graham Land.

December 14th.—The day was fine and we got an early start. We were now travelling west, so after covering about $1\frac{1}{2}$ miles I took another round of angles to the distant southern mountains, and soon after we started again an undulation in the plateau hid them from view. The surface was better than on the day we reached our survey camp, but still very heavy. We only succeeded in travelling 9·2 miles before camping-time in the evening.

December 15th.—Another fine day. We travelled on through soft snow lying thickly over wind ridges about 2 feet high, which made very heavy pulling for the dogs. However, we were travelling downhill for the first part of the day and succeeded in doing 13 miles.

December 16th.—Snow has been falling for most of the day with practically no visibility. During the greater part of yesterday we had been travelling across the lower plateau and heading for the isolated nunatak which we had passed on November 26th when travelling across the plateau from west to east. We had the nunatak's position fixed on the map, so were able to sledge towards it by steering on a compass course. After covering 5 miles we suddenly started climbing steeply, so knew our steering was accurate. A little reconnoitring on skis showed that the highest point of the nunatak lay just to the west of us, and that we were climbing an ice-spur which ran out from its east side. We sledged on for about a mile, by which time we had crossed the spur and come down on to the plateau again. We were now once more in unknown country, so we had to stop until the visibility improved.

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December 17th.—A fine day. We have been travelling towards the mountains on the north-east edge of the plateau, and we think that these should lie on the south side of the rift. The surface has been terribly bad, with high soft wind ridges which appear to have been caused by a wind from the north-west. By camping-time we had covered 10·1 miles and were right up against the mountains. There is a convenient one about $\frac{3}{4}$ mile to the north-east of us which should afford a good view over the country which we have come to explore.

December 18th-24th.—We have been lying up for all these seven days. For most of the time the east wind has been blowing incessantly, bringing up clouds from the shelf-ice, which in their turn brought snow. As our one object in coming here was to survey the country, we could do nothing except stay where we were until the weather cleared. For short periods of only a few hours at a time the mountains ahead, and occasionally the mountains to the west, separating the two plateaux, would show up, but the wind had never slackened enough to allow the clouds to clear off the country to the north. On the 23rd the wind shifted to the south and increased to a full gale, which, as there was a lot of soft snow lying, created a high drift, making surveying impossible. The gale lasted all the 23rd, but on the evening of the 24th it began to die down and we went to bed with high hopes of a good Christmas Day.

December 25th.—The wind had certainly stopped when we woke up, but the fog had returned. However, by 6.30 a.m. it showed definite signs of clearing, and by about 7 o'clock I was able to get a good view from the top of the nearest hill. Where we were camped (lat. $69^{\circ} 42' S.$, long. $63^{\circ} 55' W.$) the plateau continued northwards for 4 miles, then dropped steeply down between rocky hills to a trough-like valley much resembling the one we had seen to the south of our last survey camp, only this time the mountain range to the west where it crossed the rift dipped until its highest peaks were only about 7000 feet. There were several large glaciers flowing between these lower mountains down into the valley, which ran out to the east. Then, when about 5 miles from the cliff forming the coast, the valley gave place to low beehive-shaped

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hills intersected by glaciers. On the north side of the valley the country consisted of low foothills, gradually giving place to higher mountains to the west and north. The coast-line itself appeared to continue in a north-south direction for about 50 miles, and then swing out to the east, forming a mountainous point about 60 miles away. I could not distinguish the coast-line with any degree of accuracy because of the low cloud over the shelf-ice, and there may still be low-lying country to the east of its present mapped position. When I returned to camp after completing all the survey which I could do from this point, I started taking down the tent, while Bingham went off to take photographs and collect rocks. He soon got what he wanted and returned in time for us to get a reasonably early start back to our *dépôt* in the mountains.

The surface after the gale from the south was good and our sledges were now light. By 6.30 p.m. we had done 19 miles, were through the pass and back at our old camping-place in the mountains. We celebrated our Christmas dinner with an extra chocolate ration and some boiled sweets which were a present from Bertram, then Bingham went off collecting rock specimens, while I dug out the two boxes of dog pemmican which we had *dépôté* while on the outward journey.

December 26th.—The day has been foggy, with light snow falling, but we were on known ground, so were able to travel safely. There must have been a lot more wind on the upper plateau, for the surface is excellent, and without travelling late the dogs were able to cover 27 miles.

December 27th.—The day began much like yesterday, but gradually cleared until at lunch-time, although the sky was still overcast, the visibility was good. The surface remained the same and we did 27·2 miles.

December 28th.—There was a strong north-east wind with drifting snow when we started in the morning, but it was slightly behind us and only helped us on our way. At midday we had a hurried lunch eaten while sitting on our snow-shoes in the lee of Bingham's sledge.

Soon after we started again the wind slackened and we could see down

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on to the shelf and sea ice of Marguerite Bay. We were still 130 miles from home, but this first sight of well-known landmarks and the sea—always a thing of life even when frozen—gave us a pleasant sensation of familiarity which was a relief after the austere country through which we had been travelling for the last forty-five days: a country which had known eternal peace until we, two puny little black dots in its vastness, had the impudence to lift the curtain for a few brief days and look upon its beauty. Now that we were leaving it behind I had a feeling of intense pleasure in knowing that we had travelled its glaciers and scaled its mountains and come through safely. But this feeling was tinged with one of loss as though a friend had died, for the curtain had again dropped, and, in dropping, had hidden a scene difficult to put into words. Day after day we had travelled through silence which was absolute, not a depressing silence as of the dead, but a silence that had never known life. Even more impressive had been the sheer immensity of the country, and the atmosphere of mystery which seemed to dwarf us—the great mountains which have stood there untroubled for countless years, and the glaciers slowly forcing their way downwards, occasionally muttering in their depths to remind us that even here time goes on. And to think that when we return to England one of the first questions we shall be asked—probably by a well-fed business man whose God is his bank-book—will be, “Why did you go there?” How can one reply other than flippantly to such a mentality? But the high plateau of Graham Land is no place to indulge in day-dreams, and we hurried on.

By 6.30 in the evening we were down to the point where we had met Stephenson's party on November 11th, and camped on the edge of the plateau after having covered 27.6 miles.

December 29th.—When we woke we could hear a north-east wind flapping the outer cover of the tent, and snow pattering on the windward side, but on looking out we could just distinguish the rock exposures on the nearest mountains, which were all the landmarks we needed for finding our way to the shelf-ice below. As we reached and passed the

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thousand-foot mark the surface changed from the dry-grained snow of the plateau to the wet slush of the lower levels. Just before we reached the depôt where we had parted from Stephenson, Fleming and Bertram, we started meeting crevasses which had been opened up by the thaw. We went forward more slowly, but nevertheless reached the aeroplane depôt on the shelf-ice at midday. By now the snow had stopped falling and the clouds had lifted off the mountain-tops, enabling us to start across the shelf-ice, steering by landmarks which we both knew well. We camped at 6 o'clock, having done 19.5 miles, and after getting into the tent speculated on the future: Were we going to find the sea-ice still passable and be back at the Base in a few days? or would we be held up at Terra Firma for several months until the ice opened up at the end of the summer? or, what seemed the most probable, might we have to wait on the north side of Red Rock Ridge until the *Stella* could come for us?

December 30th.—Today has been a difficult one. A north-east wind has been blowing, but as the temperature was well above freezing there has been no drift. Our main trouble was caused by the rifts and cracks which are now much more open. We eventually found a way through and camped on the final slope where the higher ice of the shelf falls away to meet the ice in the small bay which was our original way up. While Bingham prepared camp I skied on to examine the sea-ice. The tide-crack had opened up, and there were several leads formed through the pressure caused by movement of the shelf-ice. I luckily found an easy way across them out on to the main body of the bay-ice, which appeared still unbroken.

December 31st.—A sunny day, ideal for crossing the bay to Terra Firma, which, when we left camp, we could see clearly 20 miles away. The ice proved solid except for one or two small cracks not more than a foot wide, and we had an uneventful day, except for the excitement caused by some wandering penguins which came to welcome us—a gesture much appreciated by the dogs.

When we reached the southernmost island of the Terra Firma group,

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where Hampton was to have left our dépôt, we found the small bay which used to be the best way on to the island full of open water, forcing us to take a more hazardous route; first crossing the tide-crack on floating pans and then scrambling up a steep ice-foot. However, the sledges were now light and the dogs got up without much trouble. We sledged across the island till we were near the position decided on for the dépôt, and found it neatly stacked on the rocks. We now knew that our position was secure, and as travelling at night at this time of year is far more agreeable than during the day, we decided not to push on in the morning, but to spend it in ski-ing to the north side of Terra Firma and climbing the rocks above our old mid-winter camp, from which we should get a good view of the ice for the next stage of our journey.

January 1st, 1937.—We were up at 8 o'clock in the morning and found a sunny day. We set off for the north side of Terra Firma as soon as we had had breakfast. After a good deal of trouble caused by open water among the islands and skerries we reached our old camping-ground, which now looked very different, as most of the snow had gone from the rocks. We soon climbed to near the top of the island and had an excellent view to the north. We were only about 400 feet up, so could not get much idea of the state of the ice beyond the first 4 or 5 miles. For at a greater distance the angle at which one sees the surface becomes too acute, and even leads several hundred feet wide are indistinguishable.

We returned to the tent and lay down for an hour before packing up ready to leave at 6 o'clock in the evening. When we started the tide was low, making the way off the island far from easy. I came down first, and my dogs negotiated the ice-foot and loose floating pans without any excitement. I drove on for some hundred yards, and then turned round to watch Bingham bring his team down. All was going well when suddenly, just as the dogs were crossing the ice-pans, there was a surprised squawk and a penguin came wandering round the corner of the island. The squawk was followed by several more, as his four friends came hurrying up to see what was happening. This was too much for Bingham's dogs, and they shot off at a right angle towards

THE FINAL SLEDGE JOURNEY

the penguins, which were by now only a few yards away. The sledge was dragged sideways and fell into the water between two pans. We got it out as quickly as we could, but not before the handle-bar bag had filled with water. Bingham's Leica camera was in the bag and of course got completely soaked, ruining a partly exposed film which, unfortunately, had some valuable exposures on it, taken while we were at our most northern survey camp.

Soon after leaving Terra Firma behind, we met the first lead which barred our progress, but after sledging beside it for about a mile we found a flat pan which we used as a bridge. From here on the leads and thaw-pools were more numerous, and after fifteen hours' strenuous travelling we eventually covered the 30 miles which separates Terra Firma from the Refuge Islands. Just as we arrived on the islands sleet began to fall. We pitched our camp hurriedly near the depôt which had been left here, then Bingham killed a seal near by, and after a large meal we and the dogs settled down for a well-earned sleep.

The sleet continued, accompanied by fog and a northerly wind, until midday on the 3rd. The sky then cleared and the visibility improved, enabling us to get a good view from the top of the island. We could see a lot of open water off Red Rock Ridge, but it looked as if we might avoid it if we kept well out to sea while rounding the point. The alternative was to sledge about 4 miles to the east and attempt the col at the inland edge of the ridge. We both favoured the sea-ice route and decided to try that way first. We took down the tent and prepared to leave, but just as we were lashing up the sledges the wind swung to the south and a thick fog settled down, completely blotting everything out. We pitched our pup tent and waited for the fog to lift. We waited until well into the night, but nothing happened. At 11 o'clock we went to bed, and set the alarm watch to go off at intervals of two hours, when we would take it in turns to look out at the weather. The fog stayed with us until the early morning of the 5th, when at 1 a.m. it began to lift from the mountains but still remained covering the seaward end of Red Rock Ridge. By 2 o'clock it was still heavy out to sea, but the land

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was quite clear, so we decided to try to reach the Base by the route over the col.

We started at 3 a.m. and had a fast but wet run through and between the thaw-pools until we reached the foot of the glacier which flows down from the col to the sea-ice. Here Bingham remained with the dogs to try to keep the peace if any inquisitive penguins arrived, while I skied ahead to find a route up the glacier. The glacier looked much more formidable from sea-level than it had done from the aeroplane. It rose steeply above us to a height of 1000 feet. On its lower slopes we could see many open crevasses, and higher up the dark shadows cast by concave bridges which had not yet collapsed. When I got among the crevasses I found that they were not as bad as they appeared from the ground, for the worst of them were on the lower levels, and here the bridges had mostly collapsed, leaving the crevasses well exposed. However, they were bad enough to necessitate bringing up the sledges one at a time.

On reaching the top of the col we were relieved to see that the ice, though covered with thaw-pools, was still holding in Neny Fjord. We were now only 14 miles from home, and with the ice still bearing in front of us we felt sure of reaching the Base. There were fewer crevasses on the north side of the col, and we had an easy run down to the sea-ice, reaching it safely by 9 a.m. We had been travelling for six hours, so stopped for a few minutes to have a welcome cup of tea from a thermos, then set off on the final stage of the journey, which consisted of wading through slush and water for another five and three-quarter hours. We were seen from the hut as we neared the Base, and after negotiating the final tide-crack were met with a warm welcome as we scrambled up the rocks. We had been away for 72 days and had completed a journey of 535 miles.

CHAPTER TWELVE

CONCLUSION

THE evening Bingham and I returned was naturally taken up with giving our news and hearing what those at the Base had to tell us, both of their own doings and of the world at large. Soon after the return of the sledge party from the new sound on November 19th, Fleming, Bertram and Moore had made a short sledge journey to the north of the Base, which had had the combined purpose of visiting the Adélie Penguin rookery on Lagotellerie Island and giving Fleming a chance to continue his geological work.

The other penguin rookery at Red Rock Ridge had provided us with a good supply of eggs. By sledging the 12 miles to it at regular intervals, and working the nests systematically, Hampton had been able to bring back 1220 eggs, which had then been packed in barrels of flour, thereby ensuring that they would keep fresh for many months.

We were also told that the *Penola* had left Port Stanley on December 28th, which should give her plenty of time to keep up with her arranged schedule. The only disappointing piece of news was that after Hampton had landed our depôt at Terra Firma Island the weather had not been clear enough for the flights which we needed to finish our survey until the ice had become too covered with thaw-pools to make taking off possible. Hampton had actually tried on one occasion, but after bumping in and out of the holes for some time had had to give it up as hopeless. We had therefore to wait until the aeroplane could fly off floats. Flying off floats has the serious disadvantage of reducing speed and considerably cutting down the range of the aeroplane owing to extra weight, to say nothing of the added danger of a forced landing in the mountains.

The first flight we proposed making was across Alexander I Island to

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try to discover something of its west shore, for although we had been able to explore its north and east coasts fairly thoroughly, the rest of the island was still an unknown quantity.

The second flight would be to the north as far as the supposed position of Crane Channel. Wilkins, who had first reported it, had not been at all definite about his discovery as, owing to low clouds, he never saw it clearly, and since his report its existence had been doubted by the officers on board the *Discovery II* when they entered Marin Darbel Bay in 1931. Also when Hampton and Stephenson flew from the Argentine Islands to meet the *Penola* in Marguerite Bay in the summer of 1936, although the weather was clear they could see no sign of the channel. However, they were flying some 30 miles off the coast, so were too far away to form any definite conclusion. Besides clearing up this point, the flight would fill in the gap between the surveys done from our Base on the Argentine Islands as far as Cape Evensen, and that done from our Southern Base to the north end of Adelaide Island.

But before either of these flights could be carried out we should have to wait for the end of the transition period, during which the sea-ice gradually rots away and breaks up, giving place to open water. This we thought might hold us up for anything from three to six weeks according to the temperature, wind and rain. However, for the next week at any rate we expected to be able to make short local trips for the purpose of catching seals and to finish off any surveying or geological work still left.

On January 12th, Fleming, after a wet trip over the ice, climbed to the top of Millerand Island. On returning he reported that, although the main body of the ice in Marguerite Bay was wet and full of pot-holes, it was still unbroken, and any large extent of water that he could see appeared to be not so much in the form of leads as lakes measuring roughly 300 by 70 yards, except far to the north where he could see open water coming in round the south end of Adelaide Island as far as Jenny Island. After his return the ice became too unsafe for us to leave the Debenham Islands. We spent our time packing up in preparation

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for the *Penola's* arrival, and anxiously watching for the ice to open up enough to make flying possible.

At the end of January, although the greater part of Marguerite Bay was still blocked, the shore leads had opened up and there was enough open water from which to take off. The morning of February 1st was the first possible flying day after the ice opened up. It was a little cloudy to the north, but gloriously clear to the south and west, while an off-shore wind in the night had cleared the taking-off ground of small pieces of brash ice, so that in fact everything was favourable for flying over Alexander I Island. The clear area was small, but Hampton, with Stephenson as surveyor, took off on the second attempt, and here is Stephenson's account of the flight:

"The plane is much slower on floats, and flying over country which by now we know so well we appeared to be going very slowly, although we were travelling at about 80-85 m.p.h. We made for that part of the north-east coast of Alexander I Island whence I believed there was a valley running across to the west.

"After an hour and a half's flying we arrived at the bay in the coast from which two valleys led, one running west and the other south. The latter looked as if there were a clear way through, whilst the one running to the west appeared to have high mountains at the back. We chose the one which ran to the south, and literally crawled up against a strong head-wind, climbing to 7000 feet. The valley ran down behind the high 8000-foot ridge which formed the west side of the sound, which we had mapped on our southern trip. At the head of the valley the country opened out into an ice-covered plain some 20 miles long by 15 miles wide. On the east it was bounded by the high ridge, whilst on the west there was a series of lower hills.

"As we flew across this plain, which must have been about 4500 feet above sea-level, we saw ahead a big bay at a considerably lower level, and realized that what had appeared to be low rocky mountains were

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really summits of promontories rising from the lower level. Between these promontories, glaciers flowed down to the bay, a bay which we thought at first was at sea-level, but which must have been at about 2000-2500 feet. On the far side of this lower plain of ice there were high mountain masses, lying in an east to west direction, but not extending far to the west of our course, which was approximately due south. However, although no high masses ran to the west, there was apparent a snowy ridge running out towards another rock mass lying to the south-west of us. To the west of this last mass we could see nothing, as immediately on that side of us was a very high range of mountains forming the western side of the northern mass of Alexander I Island. The glaciers from this large mass also drained into the bay at the lower level.

"After flying for two hours and twenty minutes we had to turn back, having reached the southern edge of the upper plain, whence we looked down into the bay at the lower level. What we saw during that flight has enabled us to make our 'new Alexander I Island' a more reasonable shape, but its westward limits are still unknown. Quite well, too, we saw why previously people had thought Alexander I Island was only about 50 miles in diameter, for from a distance nobody could see the features we saw far to the south, and the big bay would be mistaken for sea-ice. The high ridge of the southern part of the island when seen from the west could also quite easily be mistaken for mainland, or separate islands.

"On the return journey I took photographs at regular intervals all the way up the coast to Red Rock Ridge, and since altogether I took 102 photographs and made numerous notes and sketches, the time passed pretty quickly. Fortunately it was absolutely steady in the air, the only slight bumps we got were when, to use a Canadian expression, 'we were bucking into a head-wind' up the valley."

After this flight we had a period of strong north and north-east winds accompanied by snow and sleet which made flying out of the question,

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though it should, we thought, do a great deal towards moving the ice off the coast and out of Marguerite Bay. On February 12th the weather improved a little, but the clouds were still too low and there was too much wind in the mountains to contemplate the long flight to the north. We had hoped that while Hampton and Stephenson were making this flight they would be able to get a good idea of the state of the ice in Marguerite Bay, for we thought that by this time the *Penola* should be at her old winter quarters in the Argentine Islands waiting for instructions and an ice report. As the season was rapidly advancing we decided not to wait for the northern flight, which would require a day with perfect visibility, but to take this opportunity of a moderately clear day for making a short flight to look at the ice.

Hampton and I took off soon after lunch, and climbing to 2000 feet flew to the north-west for twenty minutes. By the end of that time we could get a good view over most of the bay. South of Red Rock Ridge the ice was still holding firmly, and looked much the same as it did when Bingham and I had returned from our journey across Graham Land, though we were of course too far away to distinguish details. North of Red Rock Ridge there was a long tongue of loose pans sweeping away from the unbroken ice edge towards the north-west, while the north-east part of the bay was completely clear of ice, except for a few floes still coming out of the fjords which entered it. We were delighted to see all this open water so early in the season, for it meant that if the *Penola* kept away from the centre of the bay she could easily reach the Base.

In the evening Meiklejohn wirelessed Carse, who had learned to operate the ship's wireless, sending instructions for Ryder stating that the ice was now open, and telling him to meet the *Stella*, with Riley in charge, at the Léonie Islands. I considered it necessary for the *Stella* to meet the *Penola* in the north of Marguerite Bay for two reasons. First, Riley could give Ryder a copy of Stephenson's completed chart with soundings of the area round the Debenham Islands and, secondly, because as we now knew of the gales which blow off the mainland with

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such violence, we realized that the anchorage in front of the Base was a dangerous place for the *Penola* to lie. We had, while sledging in the winter, discovered a harbour in the Horseshoe Island only 20 miles north of the Base, where we thought the ship would be able to wait until we finished the flying which we still wished to do, if we had had no weather fine enough to do it before she arrived in Marguerite Bay. As we had only seen the anchorage in the winter, when it was completely frozen up, we naturally had no idea of the depth of the water, which might not be sufficient to let the *Penola* in. Riley, who would be accompanied by Bertram and Moore, therefore planned to spend the first night in this anchorage, and to sound it out before continuing on to the Léonie Islands.

The day after Hampton and I flew over Marguerite Bay—February 13th—turned out to be a very beautiful one, so Hampton and Stephenson prepared for the northern flight, which Stephenson describes :

“We left the Base soon after 10 o'clock and went in search of a taking-off ground. Owing to the worn pistons and cylinders caused by the oil leak earlier in the expedition, Hampton could only get 1900 revolutions a minute out of his engine when fully open instead of 2300. On a calm day with a full load we therefore required over a mile of clear water from which to take off. The trouble was that the place was strewn with small pieces of ice, and the only large clear space was along the north shore of Millerand Island where there was a flat calm. Four times we tried along this stretch ; on two occasions we began to bounce off the water, but in the absence of any wind we could not hold it and came down again. It was very tantalizing when at last she began to bounce, to have to stop trying for fear of running into bergs ahead. It was a really glorious day for the flight and the chances of getting such another were very few, so we were determined to get off if we possibly could. We beckoned to Riley, who had been patiently waiting in the motor boat to see us get off, and suggested that he towed us further out to sea where there was less ice and probably

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more wind. He took us out beyond Cape Calmette, following a zig-zag course in order to avoid towing the plane through too much floating ice. As was usual on these occasions, I sat on one float and kicked away any lump of ice that was coming against it, whilst Hampton kept the other float in the wake of the motor boat, which was usually free from ice. When we were about 8 miles out from the Base we at last saw a fairly large stretch of water ice-free and with quite a ripple on the surface. Riley cast us off, and having put the towing cable into the locker in the float and swung the propeller, I climbed into the cabin once more to wait patiently for that moment when the bergs would rapidly recede and become small white specks below us. We were unlucky the first time, but the second time, after a preliminary bounce, we really got up and stayed up, and with a feeling that we had at last conquered the elements we set our course for the north.

"By the time we got off it was 12.50, almost three hours after we had set out from the Base. It was still fine overhead and to the north, but clouds were coming up from the south. We assumed that these would not amount to much in the next four hours, and decided to go on. We flew up the east side of Laubeuf Fjord and kept to the east of the islands that lie in the narrow gap between Adelaide Island and the mainland. When we had flown down from the Argentine Islands in February 1936, our course had been to the west of these islands, so by keeping to the east of them on this occasion we were able to make quite certain that there was only one narrow channel separating Adelaide Island from the Graham Land coast.

"From the narrow strait we flew north-east, across the mouth of Lallemand Fjord towards Cape Rey. Charcot had taken the *Pourquoi Pas?* into the mouth of Lallemand Fjord, and the map of this part resembled the country very closely. North of Cape Rey, however, the maps were rather vague. Charcot had marked two bays, Auvert Bay immediately south of Cape Evensen, and Marin Darbel Bay immediately north of Cape Rey, the two being separated by Cape

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Bellue. He could not have seen the full extent of Cape Bellue, and marked it as being possibly an island, or possibly a promontory. Wilkins suggested that Cape Bellue was an island, and that Marin Darbel Bay and Auvert Bay joined east of the island, and continued inland as a fjord, to join up with his supposed Crane Channel. The *Discovery II* had reported that they had sailed into Marin Darbel Bay and that there was no sign of a channel at the back of the bay, nor did they mark any large island in the place of Cape Bellue.

"We were very keen, therefore, to get round Cape Rey and see what lay before us. We were flying at about 6000 feet and expected to see a broken coast-line forming two large bays. On rounding the point, however, all we could see was one vast bay, the northern point of which was somewhat familiar, although we could not place it at first. We flew into the centre of this bay and I studied the whole shore-line very carefully through my field-glasses, but there was no sign of any other bays or through channels. The country surrounding the bay was bold and simple. Most of the shore-line was heavily glaciated, either by valley glaciers or by fringing glaciers around the rock masses. These valley glaciers came down from between spurs that projected from the plateau itself. Most of the rock masses were continuous with the plateau, but there were a few isolated rock hills. In the north-east corner of the bay there was a large glacier flowing down from what looked like a rift in the plateau, for it had steep bare rock walls running inland as far as we could see. It must have been this rift which Wilkins suggested was Crane Channel.

"After studying the scene for some minutes we came to the conclusion that the familiar cape to the north was what we had called Cape Evensen South, in our survey from the Argentine Islands in 1935. This cape was south of Cape Evensen, at the southern end of a small bay which we had considered too small to be Auvert Bay. We had therefore called the point Cape Evensen South, instead of Cape Bellue as it should have been. We finally decided that Auvert

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Bay was quite small, some 10 miles across, and that Marin Darbel Bay was large, 35 miles wide, with no channel leading into it from the east. We had now followed the coast of Graham Land either by sledge or aeroplane, and examined it carefully, from lat. $64^{\circ} 30' S.$ to $72^{\circ} 30'$, and throughout that distance it was absolutely continuous.

"We turned at 2.45 and made for the head of Lallemand Fjord, as I wanted to take photographs of that part of the coast and Bourgeois Fjord, which I had been unable to photograph when we flew that way in March 1936.

"As we flew down the valley between Lallemand and Bourgeois Fjord, small clouds scurried past us, coming up from the south. At times complete mountain-tops were covered, and through holes in the cloud we could see the steep rock sides and open water of the fjords below. The amount of cloud increased rapidly as we went south, and we began to be anxious as to whether the Base fjord would be completely clouded over by the time we got there, for an ice-strewn sea is bad enough without having one's field of view blotted out by cloud. However, it turned out that the cloud was 2000 feet above the ground, so we came through it and were able to fly beneath it for the latter part of the journey, arriving back at the Base at 4.30."

We were seriously handicapped in our wireless communication with the *Penola*, for although she could receive messages she was unable to transmit; it was therefore impossible for Ryder to let us know when to expect her at the Base, so we decided that Riley, Bertram and Moore should leave at once on the 80-mile trip to the Léonie Islands. They started on the morning of February 14th. The day was calm but foggy, with a visibility when they left of only about a quarter of a mile. They hugged the shore as far as Cape Calmette, then Riley set a compass course across Calmette Bay to Camp Point, 8 miles further on. After sighting the point they continued, still steering through the fog by compass, towards Horseshoe Island. Before they got there a following breeze

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sprang up and they set the sail which took them along at a good pace. Five hours and ten minutes after leaving the Base they came out into a break in the fog and found themselves off the north-west corner of Horseshoe Island.

Bertram wished to visit some small fresh-water lakes which had been found in the winter at the head of the large bay which also contained the anchorage they were going to survey. They continued up the bay, but the fog at the head of it was much too thick for them to find the lakes, so they decided to go back about a mile, down the channel up which they had come, to where the anchorage for the *Penola* was situated. They reached it at 4.30; the tents and camping gear were soon got ashore, and the *Stella* moored safely for the night. After dinner the fog lifted a little, enabling Moore to start a rough map of the harbour, while Riley and Bertram went for a walk over the island in search of the lakes, which they eventually found. Bertram was excited to discover in them some fresh-water crustaceans very similar to the 'fairy shrimps' of Europe; also a few extremely small copepods, which he believes to be the first found in the Antarctic.

The next morning the fog had gone and the day was fine but overcast. The party breakfasted at 7.30, and then spent an hour sounding the anchorage and its approaches. The harbour was in the form of a lagoon about 7 fathoms deep with a mud bottom; roughly circular in shape, it had a diameter of approximately a quarter of a mile. It has three entrances; the first they sounded was 10 yards wide, but only 2 fathoms deep, and this was too shallow; the second and third were wider. One was too blocked with ice to sound; but the other showed a depth of 3 fathoms, which is enough water for the *Penola*. When they had finished sounding and had satisfied themselves that the harbour was a suitable one, they continued on their way to the Léonie Islands, which lay 55 miles further on. During the day they met two belts of drift-ice, but the pans were loosely packed and they were able to get through without any difficulty. The delightful little harbour where Hampton and Stephenson had camped with the aeroplane the summer before

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was reached at six in the evening, and here they made themselves comfortable to await the *Penola's* arrival.

The next two days turned out to be fine, and they spent them cruising round the neighbouring islands, collecting rock specimens and some lichens. On February 18th a north-east gale started, which blew intermittently until the evening of the 22nd.

On one of these days while wandering about the island, Bertram and Riley saw a strange bird which they could not at first identify. Bertram tried to shoot it with a .303 rifle which he had for killing seals, but as dusk was falling his efforts were unavailing. He was fairly certain that the bird was a pomatorhine skua, and this was later confirmed by Roberts, our ornithologist, from drawings and a description taken at the time. The pomatorhine skua is normally a dweller in the Arctic and Northern hemisphere, and this was the first time that one had ever been seen anywhere near the Antarctic. It was a particularly lonely bird, as the other skuas would have nothing at all to do with it, in fact they attacked it whenever it came anywhere near them.

The 23rd was a calm sunny day. At 10 o'clock in the morning the party at the Léonie Islands sighted the masts of the *Penola* about 5 miles out to sea, and immediately set off in the *Stella* to meet her. When about 3 miles out, they met L. C. D. Ryder and Gurney coming in in the *Mock Turtle* to connect with them. After exchanging hasty greetings and a little news, they went on to the *Penola*, which was now quite close. Riley handed over the instructions and chart to Ryder, who immediately set out for Horseshoe Island, while Riley and Bertram, in the *Stella*, returned to the camp on the Léonie Islands to collect their tent and gear, and then followed the *Penola*.

The *Penola* arrived off the harbour in Horseshoe Island at four in the afternoon, but found both the passages much blocked with ice, so Ryder wisely decided to come straight on to the Debenham Islands, which were reached soon after dark. It would have been dangerous to attempt the narrow channels leading to the main harbour until daylight, but, thanks to Stephenson's chart, Ryder was able to find a temporary

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anchorage, where the ship's party enjoyed a good night's sleep after their trying voyage from the Argentine Islands. In the morning they found the best and shortest way into the main anchorage blocked with ice, and were forced to go right round the islands and approach it from the other side, a course which necessitated passing close to the active ice-cliff of the mainland. While negotiating a difficult and narrow channel the *Penola* got a few yards to one side of her course and ran up on a rock only 150 feet from the towering glacier face, which was here about 90 feet high. In spite of every effort, she could not be warped off until the tide rose, so we spent some anxious hours wondering if the glacier would calve or not. Fortunately it restrained itself until the following morning, when the cliff opposite the position where the *Penola* was stuck calved heavily.

It is now necessary to go back in the history of the expedition to March 1936, when the *Penola* left the Southern Base for the Falkland Islands. On reaching Port Stanley, Ryder decided that an expensive refit was necessary. The expedition had no funds to meet such a heavy cost, but the situation was relieved when we received from Mr. Erling D. Naess of the Vestfold Whaling Company an extremely generous offer of assistance in South Georgia, including the free use of the Company's floating dock. This made it necessary for the *Penola* to make a winter passage from the Falkland Islands to South Georgia, and here is Ryder's own account of their movements after leaving Graham Land on March 12th, 1936:

"We sailed from the Southern Base on a perfect day; what breeze there was in crossing Marguerite Bay was from astern, so that by nightfall we were past the chain of islands and reefs to the south of Adelaide Island. However, there were still numerous growlers about, so we remained stationary with no sail up until it got light.

"The following morning at daybreak we set all sail, and thereafter dispensed with our motors till we had made our landfall. We were

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somewhat short-handed for a ship of this size. There were seven of us on board, one was cook, leaving three in each watch; of these, one of course had to be at the wheel, leaving only two for handling sail and keeping a rather necessary look-out. Fortunately we picked up fair winds from the south-east as soon as we were clear of the land, and kept up a steady 80 to 90 miles a day in a northerly direction. The winds gradually shifted through south to south-west, and then west, with only one day of calms.

“During the night of March 15th we were sheeting home for a gybe when the boom end fitting on the mizzen fell off, leaving the boom swinging wild. It was not easy to stop, but fortunately it was a bright moonlight night and we could see what was happening, and so managed to secure it with no more damage than a smashed stanchion and the loss of our log. As we could now no longer use our roller reefing, we unbent the mizzen, sent down the gaff, secured it on deck, and proceeded to set the storm trysail in its place. This was the only serious mishap we had, but it took us three days to get things ship-shape again, and rather indicated that we were too short-handed for emergencies of this nature.

“By the time this work was completed, we were well up into the westerlies and the wind was blowing very strongly from that quarter. To meet this, we had stood up under easy sail to a point 100 miles south-south-east of Cape Horn, and we were now able to run off before the strong prevailing winds. The weather was grey and gloomy, with strong hail squalls, and we continued on our way under two head-sails, averaging a steady 100 miles daily until we approached Beauchêne Island to the south of the Falkland Islands. Here the weather moderated and we were treated to a lovely, clear, sunny day. Our spirits rose spontaneously. We were crossing the Burdwood Bank and heavy seas were still rolling up astern, looking blue and magnificent in the clear morning air. The numerous albatross and Cape pigeons gliding gracefully down the advancing slopes seemed to share in our sense of enjoyment as we dried ourselves in the warmth of the sun.

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Presently we started setting sail and soon had everything set, including the bonnet we had made for the foresail. In the humdrum life of a steamer one misses the rare sense of elation and satisfaction that comes with the passing of a storm; such joys are peculiar to sailing ships and will disappear with them.

“During the day we picked up Beauchêne Island, and starting up our motors we pressed on in the hope of reaching port while the weather remained fine. At dusk we could smell the peat smoke from Port Stanley 70 miles up-wind of us, and at daybreak the following morning—March 24th—we rounded Cape Pembroke and stood into Port William. This was a most exciting moment as with wind dead ahead, freshening and squally, we found our progress stopped, and it looked very much as if we would be blown away to leeward. After half an hour, however, we began to make up a bit between gusts and to profit by the calm water. It took us in the end three hours to enter Port William and the Stanley Harbour.

“The friendliness of the Falkland Islanders on our return impressed us all, and greatly added to the joy of our arrival. Presents of such things as eggs, milk, vegetables and flowers, with which we had been unfamiliar for well over a year, were showered on us, and the hospitality and kindness throughout our stay in Stanley helped to make the time pass all too quickly.

“The day after our arrival we shifted berth to alongside the Government jetty, where we secured with wires and cables. Here we could enjoy a feeling of entire security which we had not known for many months, and very pleasant it was to be freed from the constant vigilance to which we had been so accustomed of late.

“Arrangements were soon made for Roberts to go to hospital for his operation, while the remainder started on our much-needed re-fitting work. The amount of work necessary to keep an old ship going is very much greater than is generally supposed, and we were now beginning to realize this thoroughly. However, freed from the constant drain of having to collect ice and meat, we began to make

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good headway. It was now most important for us to dock, as, apart from the damage resulting from having stranded on several occasions, the vibration of our propeller shafts indicated that an examination of the bearings was essential. The voyage to South Georgia is downwind, but we thought the return would not be so simple, so it was decided to take our topmasts and yards along with us. We also decided to increase the size of our crew. Extra accommodation had to be built, and so the 'Penola Engineering and Shipbuilding Company' once again resumed its functions. Millett soon found his way into the Government workshops, and the Town Hall was so admirably suited for a sail loft that, apart from repairing our sails, we even embarked on cutting a new one.

"On August 3rd we sailed for South Georgia, and with a fair wind the *Penola* made good progress until a somewhat unexpected run of three days' easterly wind held us up. After this we again continued in the right direction and arrived in Stromness Fjord on August 12th. It was the coldest passage we had experienced to date; the spray for the first time froze on the ship, coating the sails, decks and ropes with ice. The days were grey and cheerless, with little sun and a tendency to sleet and fog. However, life was not as bad as it sounds. We always managed to keep dry below, and with our stoves going full blast we contrived to keep one cheerful place in our grey surroundings. The alterations we had made below, and the acquisition of a second stove, were a great help in this respect. As long as one can count on a degree of comfort when one comes off watch, the unpleasantnesses are easily faced; but with a wet bunk and a stove that will only smoke, life very soon loses its attractions. Although our stoves did give plenty of trouble at first, we had them fairly well in hand by this time.

"South Georgia is not a particularly pleasant landfall for a sailing ship. It is a long pointed island, with groups of rocks on the north-west end. It is most undesirable to arrive on the windward side, as it is a bad lee shore. On the other hand, if one runs too far to leeward

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it may be weeks before the land can be regained. It is generally foggy and stormy, and bergs may be expected. Fortunately we were able to pick up Cape Buller in a clear patch, but we could not hope to reach Stromness before the short winter day ended. Accordingly we pushed on to Prince Olaf harbour, which is 20 miles nearer. This was most unsuccessful, as it was dark by the time we arrived, and missing the entrance we turned up into the wrong fjord. The night was very dark and the gusty off-shore winds locally known as 'williwaws' were striking the ship with considerable force. There was nothing to do but to take in sail and stop. It was certainly one of our most anxious moments, as we had land in close proximity on three sides and an isolated reef to seaward. Two or three times as we drifted we sighted the loom of high snow-covered land near by and had to motor away from it. When dawn came, to our mortification, no land could be seen. It was, however, only obscured by mist, and under sail and motors, with a strong west wind, we soon had it close by and in good view. After picking up the Fortuna Glacier, the *Penola* was soon rounding up into Stromness Bay. Once in the fjord, we motored slowly up against the 'williwaws,' and were piloted to a buoy off the Vestfold Whaling Company's station by the manager.

"After securing, the squalls, or rather gusts, increased. They are a peculiar feature of the place when the wind is in one particular quarter. At one moment there is a breathless calm with almost an oily surface, and the next minute a blast of extreme violence sweeps down the fjord, whipping the surface off the water and making the *Penola* quiver from truck to keel. The weather during our stay was very unpleasant at times, but at others beautifully fine. It seemed to vary from one extreme to the other. This has its merits. During the fine spells work is very pleasant, and during the bad spells work is impossible, and one can lie in one's bunk with a clear conscience and enjoy it. In the 'Sailing Directions' the weather at this time of year is classified as 'normally terrible.' This made us wince a bit when we read it at first, but it appears to be rather an over-statement.

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Certainly the fine clear weather in-between-whiles, with the snowy peaks reflected in the still, dark water of the fjords, goes a long way to make amends. The other remark which I remember reading is that the bottom of the harbours is covered with grease from the whaling stations, and takes the anchor several days to penetrate. This is most probably true, but we did not chance it, preferring the buoy to which we had been taken.

“There were only five men and the manager’s wife at Stromness when we arrived. However, they seemed ready for anything, and the manager sent messages to the neighbouring stations. Husvick spared us their best shipwright, a venerable Viking with a red beard, who filled us with admiration. The sight of him tackling large balks of timber with his adze is not likely to be forgotten—one could not help wondering if he used the same instrument for shaving when the occasion arose. Messrs. Salvesens also undertook to make or mend any metal fittings, which offer was of the greatest help. However, the donkey-work, and there was plenty of it, fell once more on the crew. The floating dock, unfortunately, had no bilge blocks, and the *Penola* being old, there was only one thing for it, and that was to lighten her. We at once set about removing everything portable, all the stores, cargo, ship’s equipment, drums of fuel oil, anchors and cables, and, finally, 30 tons of ballast. Everything had to be taken ashore on a flat-bottomed lighter and either covered with a tarpaulin or sledged up to a hut. Some of it was decidedly unpleasant work, especially lifting out the slimy bars of iron ballast from the bilges. This completed, we docked in the floating dock for eighteen days. Then of course the whole lot had to go back, and in addition the ballast had to be fastened down again.

“A full description of our refit would be tedious to most people, though to us it was of the greatest interest. Our only serious trouble was the remarkable condition of our propeller shaft bearings. They must have been very near the end of their tether, for one of them had worn right through, so that the shaft was actually running

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on the stern tube. It was most fortunate that we were able to replace these when we did. The Norwegians made a jib-boom for us out of the *Discovery II's* spare spar, and also encased the lower 18 feet of our foremast with 2-inch planking clamped in with steel bands.

"After re-embarking all our gear, the topmast and yards had to go up, the jib-boom shipped, running rigging and sails bent, and the standing rigging set up. Our party certainly worked harder than a professional crew would have done while we were at South Georgia, and I noticed on occasions work continuing when even the Norwegians had kept indoors on account of the weather. The strength and endurance of our crew had been increased by the addition of an expert cook. In a small vessel I am sure that a good cook who will serve palatable meals in any weather is worth considerably more than an extra deck hand. In comparing the merits of an amateur crew against a professional one, our experience at South Georgia emphasizes what I had noticed from the start, namely, that although the professional maintains a steadier consistency at the monotonous work over long periods, an amateur crew of educated men are capable of greater effort when called upon in an emergency.

"We got very fond of the whalers while we were in South Georgia. They seemed to us so human and full of humour, and worked splendidly for us, for which we were very grateful. We also found the whaling stations and their equipment, their motor boat and catchers, of the greatest interest. Only two land stations continue to operate, as pelagic whaling has proved more profitable. However, several companies continue to refit their catchers there, and the workshops are remarkably well equipped, there being, for instance, no less than three foundries in Stromness Bay alone capable of castings up to a ton. The Norwegians are well suited for the type of life they lead in South Georgia, and make full use of all opportunities. For instance, they keep sheep and goats, pigeons and large numbers of pigs. The manager of Stromness introduced us to an enormous sow

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which he claimed weighed 140 kilos. She was later killed in our honour, a gesture which we much appreciated.

“On October 2nd we left our buoy, and after motoring out of the fjord we set sail. The wind unfortunately shifted into the north-west, which, together with a strong current, set us badly to the eastward. After two days of this we were in fact some 140 miles further from our destination, and had begun to sight growlers. After that, however, the wind gradually freed us on the port tack, and we were able to make good progress in a northerly and, finally, north-westerly direction, sailing full and by all the while. When we reached lat. 43° S. we gybed round on to the other tack, and thereafter worked whichever tack was the most advantageous for making westing. Thus we continued until north of the Falkland Islands, from which point of vantage we hoped to drop down to Port Stanley. The ‘dropping down,’ however, was not quite so quick as we had hoped, for we had a series of calms followed by light southerly winds. However, we made the land on October 31st, and motored to get in before dark. Again head-winds thwarted us when only 20 miles short, and we ran back and anchored for the night in Cow Bay, on the north-east corner of the Falkland Islands. The next day was gloriously fine and we motored in.

“The return from South Georgia was an interesting voyage, being 780 miles directly against the prevailing wind. It took us thirty days, during which we sailed 2536 miles. It was certainly a warmer and pleasanter trip than the outward one, but at times we had some very bad winds and lost much good ground by being hove to, or by being unable to come round on to the best tack. We also tore our best square topsail right across, and it was some days before we had suitable weather to replace it. For this round voyage we had three Falkland Islanders, two boys, Hennah and Barnes, as passage workers, and Halliday as cook. The newcomers pulled their weight well and made it possible for Roberts to stay in South Georgia and to continue his ornithological work there; moreover, owing to the kindness of the

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Captain of the *Discovery II*, he was allowed to accompany her on one of her southern voyages before returning to Port Stanley.

"Our visit to Stanley this time was pleasantly broken by the visit of the *Discovery II* for two days, during which time they again assisted us in sending down our topmasts and yards, and in various other ways, for which we were very grateful. After her visit came the Christmas festivities, followed by the horse races, at the end of which there was a special race for the crew of the *Penola*, in which all of us took part, much to the amusement of the inhabitants.

"The mail boat arrived on December 28th, and having collected the mails, we left the following day for Deception Island. This passage was a difficult one. What with head-winds and calms it took us no less than ten days to make the first 115 miles, added to which there was a short swell or loup the whole time, causing bad racketing of gear aloft. After that we had two short but strong blows from the north, which shifted in each case quickly to the east and died away. These helped a bit, and by January 17th we were just under 100 miles north of Boyd Strait in the South Shetlands.

"During the afternoon, Carse, who was our wireless operator, intercepted part of a wireless message from the Captain of the *Discovery II*, which was working in the South Shetland Islands, to another ship whose name he unfortunately did not hear, saying that a motor-boat party from the *Discovery II* was feared to be lost near Esther Harbour. The message went on to say that the weather was bad and asked the other ship for assistance to make a rapid search of the coast-line during the first fine spell.

"We were probably the nearest ship, so we ran off, and with motors going and a freshening wind we made good progress. In fact, we beat our previous record by doing 9 miles in the hour. Esther Harbour, which is uncharted, is reported as a bad anchorage by the early sailors, and is exposed to the prevailing winds. It is situated right at the north-east corner of the South Shetlands. We set our course some 30 miles to the west of it so as to avoid being set to

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leeward of our objective, and by nightfall we were not more than 15 miles from the shore. As the visibility was very poor, and the coast very foul, we let the ship drift slowly along parallel to it under head-sails. At daybreak we stood in and picked up Ridley Island through the mist close to Esther Harbour, and motoring close past it searched the shore carefully from aloft with binoculars. After this we proceeded in towards where the harbour is indicated on the chart. However, at this moment we sighted the *Discovery II* and a cruiser which we identified as H.M.S. *Ajax*. Then a succession of snow-squalls blotted out everything and we were obliged to maintain our position on an iceberg. When it cleared, the others were not coming up our way, so we ran down-wind to them. As it happened this was a pity, as we had been heading straight in for the marooned party. They could see us approaching and then turn away, which must have been most discouraging for them. We offered our services through the megaphone, first to the *Ajax*, but not receiving much response we consulted with the *Discovery II*, who asked us to examine the coast on the south side of the island. This we proceeded to do, working slowly along the coast, as close as was safe, examining all likely places with binoculars from the crow's-nest. Before we finished, however, we heard the good news that the *Discovery II* herself had found the party, who had spent nine days under an upturned dinghy, their motor boat having sunk.

“Owing to light head-winds we remained at anchor under the lee of Penguin Island and collected seal meat. This island is a small volcanic one and was visited by Bransfield, who made a small plan of the anchorage. During the forenoon the *Discovery II* came in and we were able to hear at first-hand all about their mishap.

“The next day, and in fact for several days, it was flat calm, with an oily surface on the water. This was splendid for us, as it enabled us to motor to Deception Island without difficulty. Having only one engineer hampered us considerably, but in this weather we were able

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to do 5 knots and to reach Deception Island by January 22nd, where we once again anchored in Whalers' Bay.

"Some whalers had visited the place during our absence and had, unfortunately, ravaged the dump we had left, allowing it to get damp and spoiling many of the biological specimens. Having collected our gear on the day we arrived, we were ready to sail on the next. This plan did not materialize, however, as we lay stormbound for two whole days, and so did not weigh anchor until January 25th. This left us a bare five days to reach the Argentine Islands by the date we had arranged. It would, however, have been just possible—but we had a head-wind for four days. During this time we had only made good 8 miles, so we ran back to top up with water and seal meat in case we were seriously held up. On this last trip we drifted to and fro across Bransfield Strait with light head-winds and fog, the weather at times being very thick. On one occasion it cleared quite suddenly and disclosed two large bergs on either hand, not much over 100 yards away. Although there was no danger at the time, we were thankful that we had no more fog.

"Our second attempt to reach Port Lockroy started on January 31st, and we were not held up until the following afternoon. We were on the point of rounding into the lee of Dallman Bay when the southwest wind returned and foiled the attempt. After drifting to leeward all night we made another attempt, and then made an unsuccessful search for shelter along the north coast of Brabant Island. Finally we ran back round Liège Island and attempted to pass through De Gerlache Strait. Here we were out of the swell and made good progress in the lee of the land as far as Cape Kisir, where, however, we found the wind blowing as freshly as ever. A most promising-looking place right at the head offered good protection, and this we entered. It was, however, a complete disappointment as we could nowhere find bottom, and after letting go in about 200 fathoms, due to an error in working our echo-sounder, we decided to lie to under the lee of the land. The place was infested with growlers and bergs, but as

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it was calm and peaceful inside, we were able to tow clear of them with the dinghy and outboard and so managed to secure a few hours' rest. During this time the wind outside fell right away, and on starting again we were able to motor the remaining 70 miles to Port Lockroy. We were treated to the strait at its best. The snow cleared off and the morning mist rose, leaving the snowy mountain ranges on either hand mirrored in the calm surface of the water, disturbed only by the *Penola's* bow wave. It was pleasant to be progressing so serenely, and in the warm sun we soon forgot our past delays. Not for long, however, as with only 15 miles to go the wind came in from ahead again. We were fairly impatient by then, so continued and made port before it had freshened enough to stop us.

"It had been a long day, but before turning in we set to and embarked our twenty-five drums of fuel oil which we had left here over two years ago. We were then ready for the first fair wind and could enjoy a good rest. When the wind came two days later it brought snow, so that for crossing the De Gerlache Strait and negotiating Lemaire Channel we had a visibility of less than half a mile. But as fair winds seemed to be rather rare we decided to start. Half-way across we ran amongst a cluster of bergs indicating a shoal, and then a sinister little reef came to view through the falling snow. We had clearly strayed from the channel that we used the year before, and, after considering things, we hauled off to the west a bit and then continued with caution. This was another somewhat anxious moment, but presently we picked up the huge basalt column of Cape Renard through a rift high up, and were able to enjoy a very pleasant feeling of relief. It was, I suppose, rather imprudent to be navigating these waters in such weather, but by taking a fair wind we had removed the possibilities of turning back. Lemaire Strait is fortunately deep and clear, so we ran through, keeping within a few hundred yards of the cliffs on the east side. It was not blocked, though, as usual, there were a large number of bergs and growlers. The approaches to our old winter quarters also were much encumbered by bergs, but one of

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the channels was not completely blocked and we were able to warp in and berth before dark. We anchored in the sound first and placed the necessary ice-anchors round the creek. Doing this in advance rendered the operation much safer, as we were able to run out our warps to the banks without delay. This time we practically secured alongside one of the banks, and could, if necessary, have run a gangway across to the shore.

"We were not due to sail until February 16th, and had been instructed to wait here until that date, in case the aeroplane should be coming up to meet us. On the 12th, however, we picked up a wireless message from Rymill saying that Marguerite Bay was open, and that the *Stella* was waiting for us at the Léonie Islands. As we had already collected the gear which had been left at the old base, we watered ship and left. Watering was another of our well-practised evolutions by now; the stream which we found on Skua Island was the best place for the purpose, as there is a pool with a cascade falling on to the beach. Every manner of receptacle was pressed into service, from a 30-gallon water butt to small enamel jugs. This enabled us to bring on board 110 gallons at a time. The problem of water is one that has to be constantly borne in mind, and when the source of supply can never be wholly relied upon it is necessary to allow a handsome reserve. For these reasons we usually rationed each man to $1\frac{1}{4}$ gallons a day.

"For the trip south we decided to go outside the Biscoe Islands. There were several dangers reported off the north-west of these islands, and we thought that it would be interesting to find out how far off the coast the dangers actually extended. On leaving we accordingly ran a line of soundings in the direction of Victor Hugo Island. The visibility was very good and we were able to add to our chart considerably. It had been our intention to work down the coast about 10 miles outside the Biscoe Islands, but shortly before dark we came across a small reef just awash, and so for our own safety we headed out to sea.

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"We had enjoyed a very favourable start. However, this was not to continue, and the voyage ended by being the most tiresome of all. After the second good day's motoring, head-winds set in and steadily drifted us north. This lasted for several days, during which we actually attempted to motor or sail, but although the wind was very light or non-existent there was always a short lop and we never more than regained our position. On February 19th the long-awaited fair wind came, and freshening quickly brought first mist and then heavy driving snow. In this manner we ran through some streamers of brash ice which were coming out of Matha Strait, though after that we fortunately had the sea to ourselves. We passed within 30 miles of the Amiot Reef in fine style, but as this weather was obviously going to last we thought it would be imprudent to run down too close to them, so lay to and drifted slowly down the coast. The wind blew up ahead, and by the following afternoon the reef was, by estimation, not above 6 miles to leeward, so we set sail and stood out to sea for some 10 miles. With the wind in its present quarter we should clear the Amiot Reef, and would then have an uninterrupted drift of 70 miles, which would eventually fetch us down to the approximate edge of the pack-ice. Twenty-four hours later this had been reduced to 35 miles, and the weather was still as thick and the wind as strong as ever, so we set as much sail as the ship would stand and, with the motors running, stood up to the north-west on the starboard tack, which enabled us to haul off quite a bit. The continual look-out to leeward for ice had been quite a strain. The weather edge of the pack would be no place for the *Penola*, and our ability to beat off was highly speculative, especially with the wind tending to shift more northerly. During the night the weather cleared and the wind came suddenly out of the east. This was a safe direction for us, but a head-wind again. We were able to anticipate a further shift and made two good tacks towards Marguerite Bay, which took us to a point 6 miles south of the Amiot Reef by the evening of February 22nd. We were at last able to motor in out of the swell until close to the reefs at the

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entrance to Marguerite Bay, where we were obliged to await daylight. The 23rd was a very satisfactory day. Motoring in the calm water, we were soon up to the Léonie Islands. Here we sent a boat in-shore but it was met on the way by the *Stella* coming out with Riley, Moore and Bertram."

Owing to the *Penola* running on the rock off the glacier face she was not finally moored until the evening of February 24th. The next day was a day of rest for the ship's party, after their long and trying voyage, before starting to load the ship. We could begin this at once, as Hampton had been able to make two local flights the day the *Penola* arrived, thus finishing our aerial survey, and he could now dismantle the aeroplane ready for packing. Hampton had brought our flying work to a very successful conclusion; not only had he flown 110 hours but he had carried out all the maintenance work himself, often having to face difficult problems under trying conditions.

Loading and watering the ship went forward steadily for two days, but on the evening of February 28th plumes of snow started to blow from the mountain-tops far in on the mainland, a sign which usually heralded a gale. In a few hours we could hear the wind roaring, like a distant surf breaking, as it blew down Neny Fjord; then it came sweeping off the glacier, lashing the sea into foaming waves and carrying the tops of them away in the form of spray and spindrift. Our anemometer had been packed up, but we had had plenty of similar winds before and estimated this one to be of the usual velocity of something over 100 m.p.h. We also knew the exact direction from which to expect it, and were able to slue the ship a few degrees to meet the storm head-on. Even so, we had an anxious time wondering if the moorings would hold, for the harbour was very restricted, allowing the ship no room to swing. On the afternoon of the second day a momentary slight shift of the wind pulled out one of the stern pickets; luckily one which was on the same island as the Base, so those on board were able to float off another warp to us on shore. Although the ship was only

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about 200 yards away, nothing could be heard above the storm, and manœuvres were slowed up and complicated by having to semaphore all communications. During the night the *Stella*, which was kept in a bay on the other side of the island, sank at her moorings, and in the morning when Riley went to inspect her he could only see the top of the mast sticking a few feet above the water. We immediately set to work with ropes and tackles and soon had her out on the beach. Several planks were stoved in, and of course the engine had to be dismantled, but no serious damage was done; in fact, after Riley and Moore had worked on her for two days she was ready for duty once more.

The wind kept above gale force for seven days, but eventually died down on the 7th. We loaded and prepared for sea as quickly as we could. By the evening of March 11th all was ready, and we sailed in the early morning of the 12th. The day was fine and calm, but the mountain-tops again had their plumes of snow. As we motored across Marguerite Bay the thoughts of those on board must have been many and varied. Personally I was genuinely sorry to be leaving a land which will always hold for me the memory of a grand country shared with grand companions.

After getting clear of the reefs at the entrance of Marguerite Bay we set a course to the south-west. For to the best of my knowledge no ship, except the *Belgica*, had sailed in the southern part of the Bellingshausen Sea so late in the season, and as March is the month when one would expect this particular sea to be most open we were keen to find where the edge of the pack-ice lay. We sighted it the day after we left the Base as indicated on the general map. It consisted of small floes tightly packed together by the prevailing northerly winds, and it had a great many large tabular bergs drifting in it. On the afternoon of the day on which we sighted the pack we were surprised to find a group of small islands some 15 miles off the coast of Alexander I Island. They were ice-covered, with a little rock exposed, and resembled most of the small island groups met with along the Graham Land coast.

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After following the edge of the pack westwards for about 70 miles and satisfying ourselves that a ship could not reach Charcot Island in this year at any rate, we turned north and started on our way to South Georgia.

In considering the sea-ice conditions along the south-west Graham Land coast there is little data to work on other than our own experiences, the *Pourquoi Pas?* being the only ship besides the *Penola* which we know definitely to have entered Marguerite Bay. All other attempts to reach this region have been made much too early in the year. Dr. Charcot found the north-west part of the bay open in the latter part of January 1909, and the ice edge as he described it compares well with the conditions which we had at a corresponding date in 1937. We saw Marguerite Bay for three consecutive summers. On February 28th, 1935, Hampton and I flew south from the Argentine Islands. When we were at the turning-point of this flight we could see well into the bay, which was open. In 1936, when Hampton and I made a flight, again on February 28th, the ice was broken back as far as Red Rock Ridge, although there was still a considerable amount of loose pack blocking the centre of the bay. In 1937 we made a flight on February 12th and found the unbroken ice edge in much the same place as on February 28th, 1936, but with rather less loose pack. I see no reason to assume that these years were in any way exceptional ones, and it seems reasonable to suppose that Marguerite Bay should be navigable late in February and all of March in almost any year.

We set our course for South Georgia on March 14th. The day was misty with wind squalls and a falling barometer, in fact no weather for a sailing ship to linger to windward of an ice edge for longer than necessary. The voyage, which lasted for twenty days, was particularly uneventful; the weather was typical of the westerlies, being mostly overcast with dull lead-coloured skies and wind squalls which, as we were sailing to the westward, took us along at a good average speed. At last, on April 2nd, we sighted the Shag Rocks, and the next day rounded the north end of South Georgia. We were trying to reach

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Stromness Fjord, but in the thick fog which was lying along the coast we missed the entrance, and carried on until the fog lifted. When we could see landmarks we found that we were practically off Grytviken, where the British Magistrate lives. We wished to see him, and as returning to Stromness would have meant facing a strengthening head-wind, we decided to put in for the night. The next day Leganger Hansen, the Manager of Messrs. Salvesen's shore station at Leith Harbour, to whom the expedition owes a great debt of gratitude for many generous acts, towed us with a whale catcher to Stromness, where we eventually arrived on April 3rd. We met with every possible kindness from the whalers, and on April 17th the shore party, with the exception of Moore, sailed for home on the *Coronda*, a transporter under the command of Captain S. Begg. Our passages had been given to us by Messrs. Salvesen, which was only part of the generosity shown to the expedition by that firm.

Moore joined the ship's party as second engineer for the voyage back to England, and after setting up the topmasts and yards, the *Penola* sailed early in May. She made the long passage under sail for most of the way, only carrying enough fuel oil to motor through the doldrums, and for entering and leaving harbours. At first the voyage was delayed by numerous head-winds, but later, when the *Penola* got into the trade winds, they were treated to a splendid stretch of sailing and did 1276 miles in seven days, which was far and away the best run which the *Penola* had ever made. After a voyage of sixty-seven days they reached the Azores. Here they took in fresh water and provisions, and eventually arrived at Falmouth on August 4th after motoring the last 300 miles. They spent a few days there and then continued to the *Penola's* final destination at Portsmouth.

PRINCIPAL DATES

<i>Penola</i> left England	September 10th, 1934
<i>Penola</i> arrived at Port Lockroy	January 22nd, 1935.
Flight to find a base	January 27th, „
<i>Penola</i> arrived at the Argentine Islands	February 14th, „
Flight to Matha Strait	February 28th, „
First sledge trip to Berthelot Islands	July 25th, „
Reconnoitring flight to find out the state of the ice	August 4th, „
First sledge journey began	August 18th, „
Depôt party returned to Base	August 24th, „
First flight to Cape Evensen	August 27th, „
Second „ „	August 28th, „
Survey sledge journey	September 1st-15th, 1935.
<i>Penola</i> left for Deception Island	January 3rd, 1936.
Inland journey	January 14th-19th, 1936.
<i>Penola</i> returned to the Base	January 27th, „
<i>Penola</i> left for the Southern Base	February 17th, „
Arrived at the Léonie Islands	February 24th, „
Anchored at the Debenham Islands	February 29th, „
<i>Penola</i> left for Falkland Islands	March 12th, „
First flight south from the Debenham Island	March 13th, „
<i>Penola</i> arrived at Port Stanley	March 24th, „
Flight to North	March 31st, „
Winter flight	June 9th, „
Winter depôt journey	June 11th-27th, „
Northern survey journeys	July 20th-Aug. 7th, „
Flight to Alexander I Island	August 15th, „
Flight to King George Sixth Sound	August 16th, „
Second flight to King George Sixth Sound	September 4th, „

SOUTHERN LIGHTS

Main sledge journeys started	.	.	.	September 5th,	1936.
Rymill and Bingham turned back	.	.	.	September 24th,	„
First depôt flight	.	.	.	October 1st,	„
Six depôt flights	.	.	.	October 2nd-11th,	„
Long flight down King George Sixth Sound	.	.	.	October 19th,	„
Rymill and Bingham started on the eastern sledge journey	.	.	.	October 26th,	„
Rymill and Bingham met Stephenson's party	.	.	.	November 11th,	„
Stephenson's party returned	.	.	.	November 19th,	„
Rymill and Bingham returned	.	.	.	January 5th,	1937.
Flight over Alexander I Island	.	.	.	February 1st,	„
Flight to Crane Channel	.	.	.	February 13th,	„
<i>Penola</i> arrived at Debenham Islands	.	.	.	February 23rd,	„
<i>Penola</i> left for South Georgia	.	.	.	March 14th,	„
<i>Penola</i> arrived in England	.	.	.	August 4th,	„

METEOROLOGICAL TABLE COMPILED FROM OBSERVATIONS MADE FROM MARCH 1935-JANUARY 1936

Position: B.G.L.E. Base, Argentine Is. Height above M.S.L. Daily Observations at 09.00; 12.00; 15.00; 18.00 & 21.00 hrs. Z.M.T. Lat. 65° 15' S. Long 64° 16' W. Z.M.T. being 4 hours West of Greenwich

MONTH		Mean Pressure at M.S.L. in Millibars	Air Temperature (°F)				Mean Cloud Amount in Tenths	Mean Daily Sunshine in Hours	Mean Speed in M.P.H.	W I N D *										Number of Days						
			Mean Daily							Percentage Observations & Mean Beaufort Force																
			Average	Max	Min.	Absolute				N	N.E	E	S.E	S	S.W	W	N.W	Calm	Fog			Gale				
March*		973.9	31.8	35.5	28.1	42.5	24.8		No RECORD	5.3	11%	14%	9%	2	2	18%	14%	9%	2	2	2%	2	1	21%	0	2
April		993.2	26.4	29.5	23.2	43.0	16.4	7.7	1.9	7.1	21%	14%	5%	4	3	14%	21%	9%	3	2	17%	2	3	13%	4	2
May		991.5	24.7	28.3	21.2	47.2	13.8	7.8	0.8	8.4	17%	17%	7%	1	2	12%	16%	9%	5%	5%	3	1	4%	12%	3	4
June		995.1	23.7	26.9	20.6	40.0	13.5	6.0	0.6	6.2	16%	16%	8%	2	2	8%	21%	6%	2	2	1%	2	1	20%	2	3
July		997.9	12.5	17.8	7.2	29.5	-9.8	7.0	1.2	6.7	4%	11%	7%	3	2	25%	28%	13%	3	3	12%	3	2	10%	1	2
August		991.1	-1.0	4.9	-6.9	38.0	-21.2	6.1	1.8	6.8	3%	7%	3%	5	1	15%	38%	22%	5%	2	5%	2	2	5%	5	2
September		996.8	11.8	18.3	5.4	34.7	-28.1	7.3	2.7	5.3	8%	3%	4%	1	2	26%	32%	11%	2	2	22%	2	2	12%	5	2
October		994.3	26.0	30.3	21.6	35.9	-2.0	9.2	1.4	13.1	43%	6%	2%	3	2	10%	12%	5%	2	2	10%	4	4	5%	7	8
November		986.3	27.5	31.7	23.2	39.5	5.5	9.4	2.5	7.3	20%	3%	2%	3	2	11%	32%	7%	3	3	2%	2	3	7%	0	1
December		992.2	32.9	36.1	29.7	43.5	22.0	8.7	3.5	6.4	11%	7%	7%	2	2	18%	23%	9%	4%	2	4%	1	3	11%	2	0
January		993.9	35.3	39.5	31.1	45.1	28.0	8.4	4.1	9.5	13%	10%	6%	4	2	14%	22%	10%	3	2	1%	2	1	18%	2	0

* Mean of five daily observations

* 28 days from March 4th only

METEOROLOGICAL TABLE COMPILED FROM OBSERVATIONS MADE FROM MARCH 1936-FEBRUARY 1937

Position
B.G.L.E. Base Barry Is. Height above M.S.L. 50 feet
Lat: 66° 08' S. **Long:** 67° 06' W.

Daily Observations at 09:00; 12:00; 15:00; 18:00 & 21:00 hrs. Z.M.T.
 Z.M.T. being 4 hrs West of Greenwich

MONTH	Mean* Pressure at M.S.L. in Millibars	Air Temperature (°F)					Mean* Cloud Amount in Tenths	Mean Daily Sun- shine in Hours	W I N D*												Number of Days		
		Mean Daily			Absolute	Percentage Observations & Mean Beaufort Force																	
		Aver- age	Max	Min.		N.			N.E.	E.	S.E.	S.	S.W.	W	N.W.	Calm							
March †	979.8	29.7	33.9	25.4	47.2	14.9	8.0	2.2	7.8	11%	16%	22%	3%	5%	1%	4%	0%	6%	3%	14%	16%	2	3
April	989.2	25.1	30.1	20.2	42.8	7.0	8.0	1.8	7.1	14%	21%	25%	2%	4%	5%	2%	5%	2%	5%	3%	14%	1	6
May	993.2	7.7	14.1	1.4	27.5	-18.0	7.4	X	13.4	10%	16%	33%	7%	3%	10%	3%	17%	2%	3%	9%	16%	1	10
June	993.3	0.1	9.7	-10.5	37.1	-37.0	6.2	X	6.8	17%	8%	7%	4%	2%	20%	8%	4%	4%	3%	13%	19%	2	4
July	991.5	6.3	18.1	-5.6	43.9	-36.5	7.5	X	7.1	16%	9%	11%	3%	2%	27%	7%	2%	7%	4%	24%	28%	0	3
August	994.7	6.0	17.2	-5.1	39.5	-30.0	7.2	X	8.0	9%	7%	14%	3%	2%	14%	8%	1%	7%	4%	15%	24%	3	9
September	979.7	20.1	5.2	12.7	43.0	-22.0	8.3	1.3	6.0	8%	9%	16%	3%	5%	6%	5%	2%	9%	2%	14%	27%	1	6
October	989.3	28.0	9.9	18.9	40.5	-15.2	7.5	3.8	12.0	14%	3%	16%	6%	1%	14%	8%	2%	4%	5%	18%	18%	1	10
November	982.7	32.8	26.0	26.3	42.0	-8.4	8.5	3.2	8.1	18%	9%	13%	4%	6%	11%	11%	3%	5%	1%	15%	15%	0	5
December	981.7	34.9	40.4	29.4	44.5	18.0	7.6	6.9	16.2	6%	3%	50%	7%	2%	13%	8%	2%	1%	2%	9%	9%	2	14
January	990.2	34.5	38.0	30.1	48.9	20.0	7.8	7.0	9.5	10%	4%	26%	6%	1%	19%	13%	3%	3%	2%	13%	10%	2	4
February †	991.6	31.3	35.8	26.9	44.1	20.0	6.5	5.4	11.0	7%	4%	37%	6%	2%	21%	4%	2%	1%	2%	11%	14%	1	6

*Mean of five daily observations

†From March 12th only
+ To February 23rd only

*Sun failed to record or was below horizon
from May 4th to August 13th

SLEDGING TABLE FOR SOUTHERN JOURNEY

Date	Number of Days since Start.	Distance travelled in Day	Total Distance	Daily Average	Date	Number of Days since Start	Distance travelled in Day	Total Distance	Daily Average	Date	Number of Days since Start	Distance travelled in Day	Total Distance	Daily Average
Sept. 5	1	10.5	10.5	10.5	Oct. 7	33	15.1	156.0	4.7	Nov. 7	64	-	462.1	7.2
6	2	8.5	19.0	9.5	8	34	23.5	179.5	5.3	8	65	-	462.1	7.1
7	3	3.0	22.0	7.3	9	35	-	179.5	5.1	9	66	12.0	474.1	7.2
8	4	7.6	29.6	7.4	10	36	16.4	195.9	5.4	10	67	15.7	489.8	7.3
9	5	11.1	40.7	8.1	11	37	22.3	218.2	5.9	11	68	18.2	508.0	7.5
10	6	11.2	51.9	8.6	12	38	21.3	239.5	6.3	12	69	13.5	521.5	7.5
11	7	8.7	60.6	8.6	13	39	-	239.5	6.1	13	70	17.0	538.5	7.7
12	8	-	60.6	7.6	14	40	-	239.5	5.9	14	71	-	538.5	7.6
13	9	-	60.6	6.6	15	41	-	239.5	5.8	15	72	15.4	554.9	7.7
14	10	-	60.6	6.1	16	42	15.0	254.5	6.0	16	73	-	554.9	7.6
15	11	-	60.6	5.5	17	43	-	254.5	5.9	17	74	20.8	575.7	7.8
16	12	-	60.6	5.0	18	44	24.6	279.1	6.3	18	75	-	575.7	7.7
17	13	-	60.6	4.6	19	45	16.8	295.9	6.6	19	76	19.0	594.7	7.8
18	14	-	60.6	4.3	Turning Point					Average Daily Distance for Whole Journey = 7.8 Miles				
19	15	-	60.6	4.0										
20	16	10.45	71.1	4.7	Oct. 20	46	24.5	320.4	6.9	Average Distance on "Travelling" Days = 13.5 Miles				
21	17	-	71.1	4.2	21	47	6.7	327.1	6.9					
22	18	10.1	81.2	4.5	22	48	22.7	349.8	7.3	Average Daily Distance on Shelf Ice South of "Rifts" = 11.5 Miles				
23	19	4.5	85.7	4.5	23	49	-	349.8	7.1					
24	20	1.5	87.2	4.4	24	50	14.5	364.3	7.3	Average Daily Distance on "Travelling" Days South of "Rifts" = 18.4 Miles				
25	21	-	87.2	4.1	25	51	23.7	388.0	7.6					
26	22	-	87.2	3.9	26	52	-	388.0	7.5	Total "Lying Up" Days = 32 = 42.1%				
27	23	-	87.2	3.8	27	53	-	388.0	7.3					
28	24	3.7	90.9	3.8	28	54	25.9	413.9	7.6	Geology and Survey Days = 6				
29	25	5.6	96.5	3.9	29	55	-	413.9	7.5					
30	26	3.5	100.0	3.8	30	56	18.6	432.5	7.7	Therefore Bad Weather Days = 26 = 34.3%				
Oct. 1	27	24.1	124.1	4.6	31	57	12.0	444.5	7.8					
2	28	-	124.1	4.4	Nov. 1	58	-	444.5	7.7					
3	29	12.7	136.8	4.7	2	59	5.3	449.8	7.6					
4	30	4.1	140.9	4.7	3	60	0.9	450.7	7.5					
5	31	-	140.9	4.5	4	61	-	450.7	7.4					
6	32	-	140.9	4.4	5	62	5.5	456.2	7.4					
					6	63	5.9	462.1	7.4					

(See Chapter Nine)

SLEDGING TABLE FOR EASTERN JOURNEY

Date	Number of Days since Start	Distance Travelled in Day	Total Distance	Daily Average	Date	Number of Days since Start	Distance Travelled in Day	Total Distance	Daily Average	Date	Number of Days since Start	Distance Travelled in Day	Total Distance	Daily Average
Oct. 26	1	15.3	15.3	15.3	Nov. 25	31	-	175.5	5.8	Dec. 25	61	18.7	338.3	5.5
27	2	23.2	38.5	19.2	26	32	22.8	198.3	6.1	26	62	27.0	365.3	5.8
28	3	-	38.5	12.8	27	33	7.7	206.0	6.2	27	63	27.2	392.5	6.2
29	4	-	38.5	9.6	28	34	-	206.0	6.0	28	64	27.6	420.1	6.5
30	5	10.5	49.0	9.8	29	35	8.1	214.1	6.1	29	65	19.5	439.6	6.6
31	6	8.5	57.5	9.6	30	36	13.3	227.4	6.3	30	66	15.7	455.3	6.8
Nov. 1	7	-	57.5	8.2	Dec. 1	37	-	227.4	6.1	31	67	20.4	475.7	7.0
2	8	4.0	61.5	7.7	2	38	6.3	233.7	6.1	Jan. 1	68	-	475.7	6.9
3	9	5.4	66.9	7.4	3	39	19.0	252.7	6.4	2	69	26.6	502.3	7.5
4	10	-	66.9	6.9	4	40	20.1	272.8	6.8	3	70	-	502.3	7.1
5	11	17.4	84.3	7.7	5	41	-	272.8	6.6	4	71	-	502.3	7.0
6	12	1.2	85.5	7.1	6	42	-	272.8	6.4	5	72	33.0	535.3	7.7
7	13	-	85.5	6.6	7	43	6.3	279.1	6.4	<p>Average Daily Distance for Whole Journey 7.7 Miles</p> <p>Average Daily Distance on "Travelling" Days 12.7 Miles</p> <p>Total number of "Lying Up" Days 30=41.7%</p> <p>Number of Surveying Days 3</p> <p>Therefore Number of Bad Weather Days 27=37.8%</p> <p>Extra Mileage Caused by Relaying on 6 Days 50.9 Miles</p>				
8	14	-	85.5	6.1	8	44	-	279.1	6.4					
9	15	1.6	87.1	5.8	9	45	-	279.1	6.2					
10	16	-	87.1	5.4	10	46	-	279.1	6.0					
11	17	-	87.1	5.1	11	47	3.0	282.1	6.0					
12	18	11.2	98.3	5.0	12	48	-	282.1	5.8					
13	19	9.8	108.1	5.7	13	49	-	282.1	5.7					
14	20	-	108.1	5.4	14	50	9.2	291.3	5.8					
15	21	3.0	111.1	5.3	15	51	13.0	304.3	5.9					
16	22	6.8	117.7	5.3	16	52	5.2	309.5	5.8					
17	23	4.1	121.8	5.3	17	53	10.1	319.6	6.0					
18	24	-	121.8	5.1	18	54	-	319.6	5.9					
19	25	6.0	127.8	5.1	19	55	-	319.6	5.8					
20	26	-	127.8	4.9	20	56	-	319.6	5.7					
21	27	8.2	136.0	5.0	21	57	-	319.6	5.6					
22	28	14.4	150.4	5.3	22	58	-	319.6	5.5					
23	29	14.0	164.4	5.6	23	59	-	319.6	5.4					
24	30	11.1	175.5	5.8	24	60	-	319.6	5.3					

SLEDGING EQUIPMENT

The equipment on a sledge journey varies with the time of year and type of country through which the journey is made, but some idea of the things carried will be of interest. The following lists show practically everything other than food and fuel which Bingham and I carried on the Eastern Journey :

- 1 pyramid tent.
- 1 pup tent.
- 1 groundsheet.
- 1 pressure stove and spare parts including prickers.
- 2 pots with lids.
- 2 cups.
- 2 plates.
- 2 spoons.
- 2 dish-cloths.
- 1 packet of matches (containing 12 boxes).
- 24 candles.
- 1 2-pint tin of methylated spirits.
- 1 medical outfit.
- 2 thermos flasks.
- 2 climbing ropes.
- 1 shovel.
- 1 .22 rifle.

Repair outfit including:

- 12 spare harnesses.
- 12 „ traces.
- Tent patching material.
- 6 leather thongs.
- 1 small roll of lamp-wick for repairing harnesses.
- 1 cigarette tin containing assorted screws and nails.
- 1 ball of cod-line.

SOUTHERN LIGHTS

- 1 ball of twine.
- 1 pair of pliers.
- 1 screwdriver.
- 1 brad-awl.
- 1 small spanner.
- 1 marline-spike.

Surveying equipment:

- 1 wireless set.
 - 1 sledge wheel.
 - 2 spare cyclometers.
 - 1 P 4 compass.
 - 1 Watts $3\frac{1}{4}$ -inch theodolite.
 - 2 prismatic compasses (1 dry and 1 liquid).
 - 1 torch with spare battery and bulbs.
 - 2 thermometers.
 - 3 aneroids.
 - 1 *Nautical Almanac*.
 - 1 *Hints to Travellers*, vol. 1.
 - 1 angle book, R.G.S. pattern.
 - 2 traverse books.
 - 2 notebooks.
 - 1 meteorological notebook.
 - 1 canvas roll with compartments for parallel ruler, metal diagonal scale dividers, protractor and pencils.
- Navigating sheets carried between two 3-ply boards which fit into a canvas case.
- 1 Leica camera and films (carried by E. W. B.).

PERSONAL EQUIPMENT

Personal equipment, like general equipment, varies according to the time of year and type of country, and also with personal taste. Therefore the following list shows that which I myself carried on the Eastern Journey and includes clothes both worn and carried as spares:

- 1 alarm watch.
- 1 pair of snow-shoes.
- 1 „ skis.
- 1 ice-axe.
- 1 ice-chisel.
- 1 pair field-glasses.
- 1 bed roll made up of a Woods Arctic Senior sleeping-bag, a strip of oiled canvas and a deerskin.
- 1 cap.
- 1 shirt.
- 1 Mackinaw shirt.
- 2 wool vests.
- 1 pair of wool pants.
- 1 „ grey flannel trousers.
- 6 pairs of wool socks.
- 2 sets of Hudson Bay Co.'s duffle slippers (2 pairs of slippers in each set).
- 1 pair of seal-skin boots.
- 1 „ moose-hide moccasins.
- 1 set of windproofs (Wordie cloth).
- 1 scarf.
- 2 inner duffle mitts.
- 2 outer moose-hide mitts.
- 1 pair of wash-leather gloves with silk inners for theodolite observations.
- 2 handkerchiefs.

SOUTHERN LIGHTS

- 1 pair of light windproof leggings.
- 1 roll of toilet paper.
- 1 housewife.
- 2 pairs of Salvoc yellow snow-goggles.
- 1 sheath knife (with straight back for scraping sledge runners).
- 1 clasp-knife.
- 1 book for reading.
- 1 diary and pencils.

MEDICAL SUPPLIES

In writing on medical supplies it is assumed that any prolonged expedition includes a doctor who, by the nature of his training, will be a careful and thoughtful man and, therefore, if he has no previous experience of polar work will tend to take too much rather than too little. This, except for the unnecessary drain on expedition funds, does not matter so far as supplying a base or a ship is concerned, but on a sledge journey where weight and space is of the greatest importance an adequate minimum should be carried.

One important side of an expedition doctor's work, which is not always realized at the outset, is dentistry, for it is a pity to have to lose good teeth which could be saved by a temporary filling.

Bingham has prepared the following list of medical supplies which should be carried on long sledge journeys:

Medical stores taken on sledging trip per unit of four men

	No.
Cotton-wool in 2-oz. compressed packets	4.
Gauze " " " " " " " "	2.
White surgical lint " " " " " "	4.
Boracic lint " " " " " " "	2.
Picric lint	1 sq. yard.
3-inch roller bandage compressed	6.
1-inch " " " " " " "	4.
Triangular bandage " " " " " "	3
Adhesive tape, 2½ inch	1 spool.
Boric powder	1 oz.
Ung. Oxi Flav. dil	Small pot.
Pil. Col. Co.	1 doz.
Aspirin	25.

SOUTHERN LIGHTS

Lanoline	No Small pot.
Resinal ointment	2 oz.
Safety pins	2 doz.
Adrenaline — 'Tabloid' Ophthalmic, 0.0006 gm. each. Labelled Adrenaline Tartrate; for snow blindness, in tubes of 1 doz.	4.
Eye bath	1.
Silk and gut for sutures in tubes of alcohol with needles attached	Various.
Horse-hair for sutures and needles.	
Thermometers	2.
Flavine (powder) made up in paper folders inside air-tight tin. Each folder to contain correct amount for making up $\frac{1}{2}$ -pint flavine solution.	
Morphia— $\frac{1}{4}$ -gr. cachets in air-tight tin. 2 tins of 48 doses per tin.	
Scissors	1 pair.
Scalpel	1.
Tooth forceps. Root and Molar	1 pair each.
1 clean cloth (such as tea-cloth will do).	
Dental syringe and Nuvotox solution. May be taken if there is a doctor present. In this case also one can take 1 small set of minor surgical instruments as included in the naval field dressing-case.	

SLEDGING RATIONS

Our sledging rations were based on those used by the British Arctic Air Route Expedition, but owing to the experience gained in Greenland we were able to make a considerable reduction in weight. Our daily ration for one man was:

	Ounces.
Biscuits	2·7
Cocoa	0·8
Oats	2·0
Chocolate	2·4
Pemmican	5·6
Sugar	3·2
Yeast	0·4
Milk powder	1·6
Margarine	5·6
Pea flour	1·6
Total	<u>25·9</u>

Also, 1 tablespoonful of Califorange (concentrated orange juice prepared by the California Fruit Growers Exchange Ltd.) and 1 Adexolin capsule (Halibut oil).

These rations were packed in 3-ply boxes, each box containing the right amount to last 2 men for 10 days.

The paraffin ration, which was 1 gallon for 1 tent for 10 days, was carried in 2-gallon petrol tins.

For further information regarding sledging rations the reader is referred to the Eleventh Edition of "Hints to Travellers," Volume Two, published by the Royal Geographical Society.

EMERGENCY EQUIPMENT FOR TWO MEN CARRIED IN THE AEROPLANE ON ALL FLIGHTS

<i>Summer</i>		<i>Winter</i>	
	lbs.		lbs.
Inflatable rubber boat to carry 275 kilos. Inflating apparatus and two light paddles .	36	Light double tent, complete .	7
Light double tent complete .	7	24 days' rations at 15 oz. per day. Primus cooking-pot .	25
24 days' rations at 15 oz. per day, small Primus and cook- ing-pot	25	Spare footwear and socks .	3
2 double down sleeping-bags .	5	2 reindeer-fur sleeping-bags .	18
1 gallon kerosene and tin .	10	1 gallon kerosene and tin .	10
Air Ministry pattern anchor .	25	4 mooring bags and rope .	22
20 fathoms $1\frac{1}{4}$ -inch rope .	17	Small shovel	$3\frac{1}{2}$
Boat hook	3	Ice-chisel	$1\frac{1}{2}$
Verrey pistol and 8 cartridges .	5	Engine muff and blow-lamp .	25
Box spares and float repair out- fit	5	Can for draining oil from tank	4
2 signal flags	$\frac{1}{2}$	Box spares (plugs, rubber pipe- joints, repair outfit for fabric, etc.)	5
		Verrey pistol and 8 cartridges .	5
		2 pairs snow-shoes	8
Total	<u>138$\frac{1}{2}$</u>	Total	<u>137</u>

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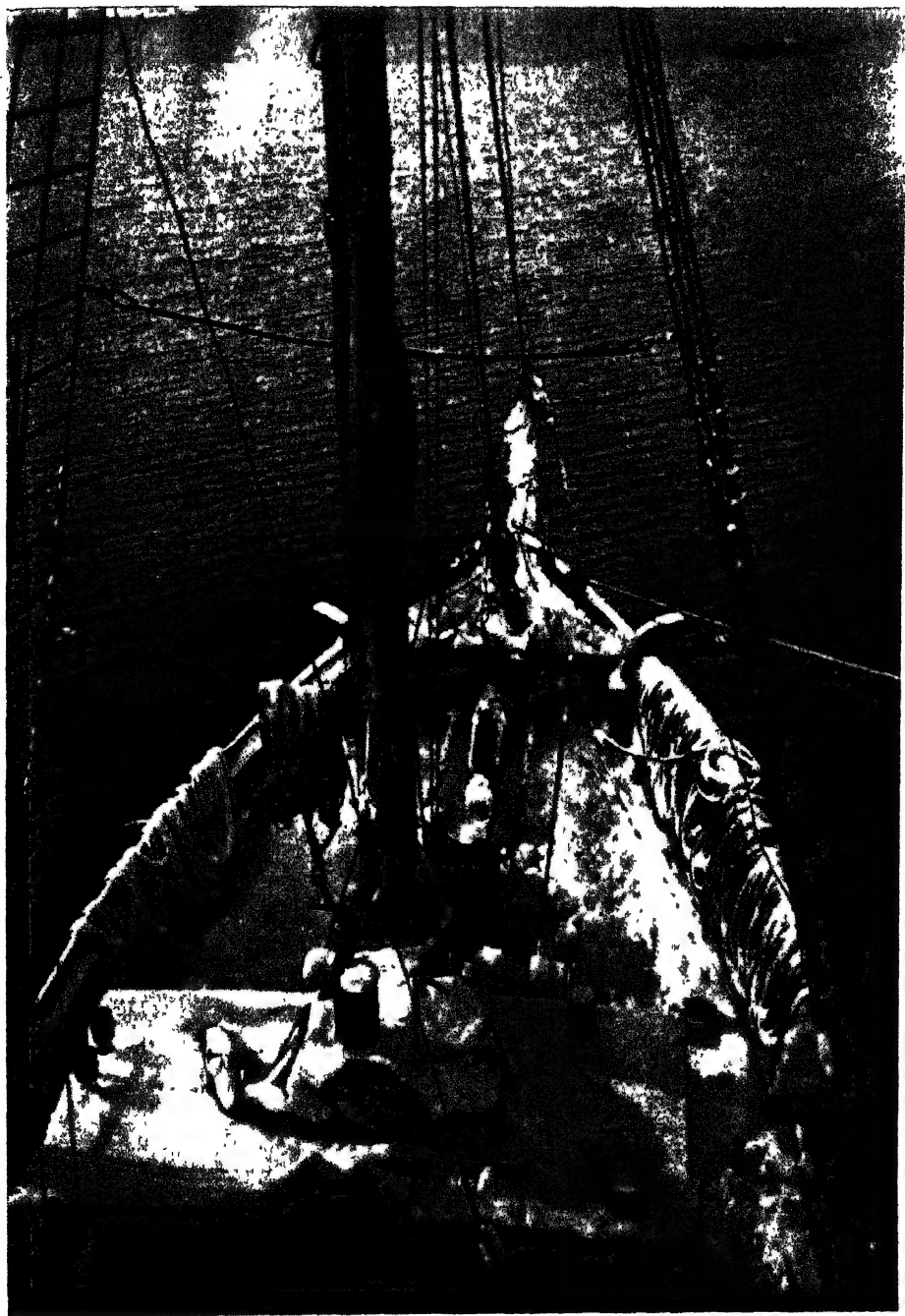
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The *Penola*'s deck after a fall of snow

N. A. G.



Laying the Dépôt on the Berthelot Islands

A. S.



W. L. S. F.

Ski binding of leather and canvas developed by the Expedition



Aerial view of the Argentine Islands

R. E. D. R.





Building the Northern Base

W. E. H.



A sunny day on the roof

E. W. B.



B. B. R.

Looking north from the Berthelot Islands



I. F. Meiklejohn



Q. Riley



J. I. Moore



A. Stephenson



John Rymill



E. W. Bingham



W. L. S. Fleming



W. E. Hampton



B. B. Roberts



N. A. Gurney



H. Millett



J. H. Martin



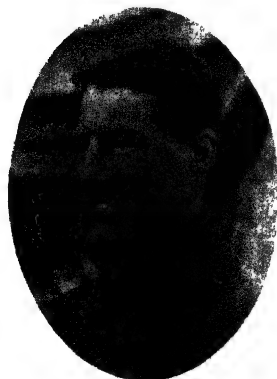
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G. C. L. Bertram



V. D. Carse

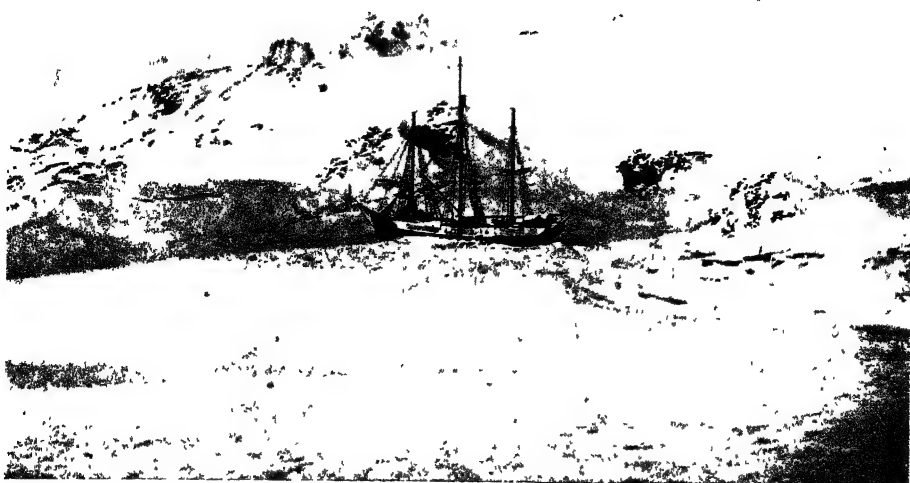


L. C. D. Ryder



A spring day at the Northern Base

E. W. B.



The *Penola* frozen in in the Argentine Islands

A. S



Cutting the ice to free the *Penola*

W. L. S. F.



I. F. M.

Deck cargo of the *Penola* on her way to the Southern Base



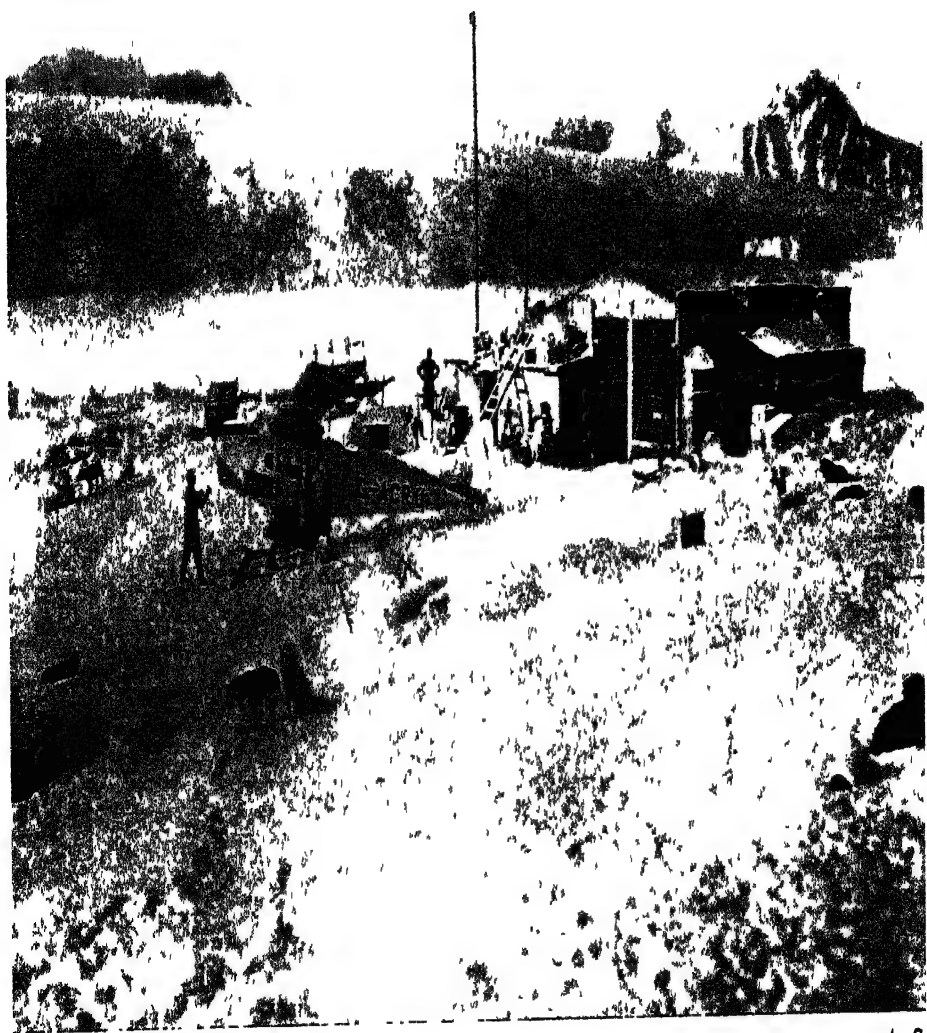
One-year-old solid bay-ice

R. E. D. R.



W. L. S. F.

Preparing to pull the aeroplane ashore



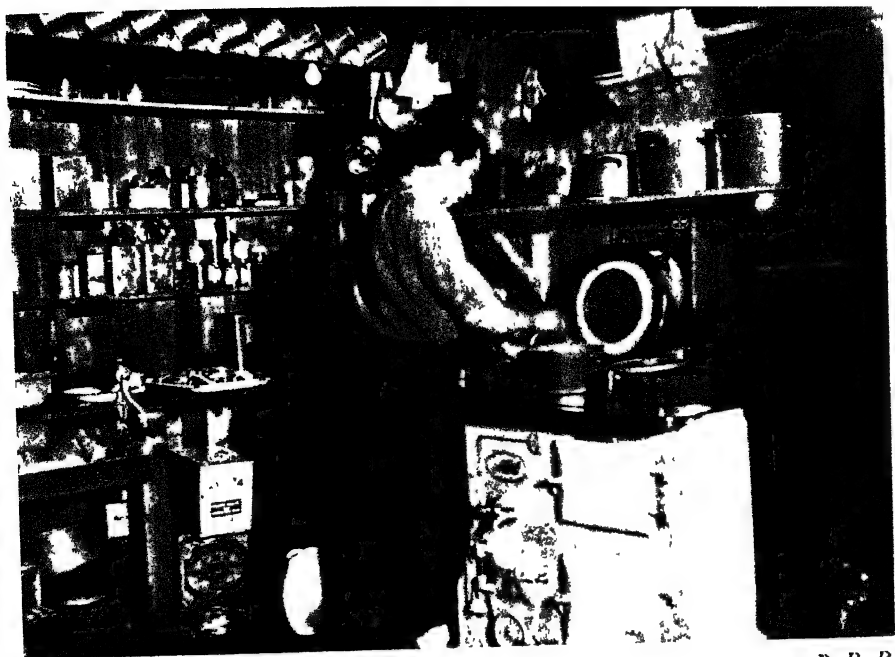
A. S.

The Southern Base in early spring



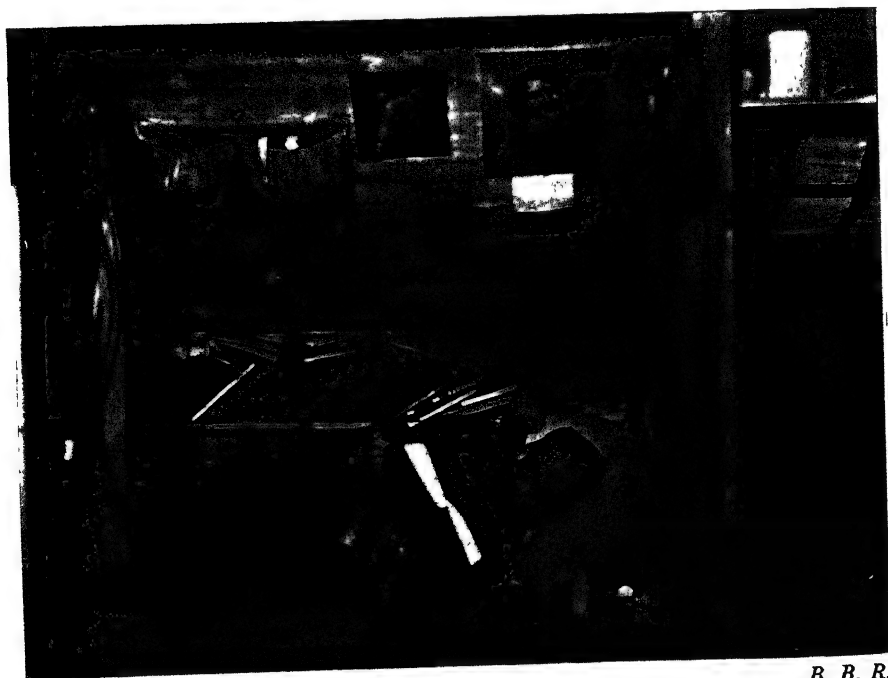
A. S.

Interior of the living-room



The kitchen with Aga Cooker

B. B. R.



Bingham in bed

B. B. R.

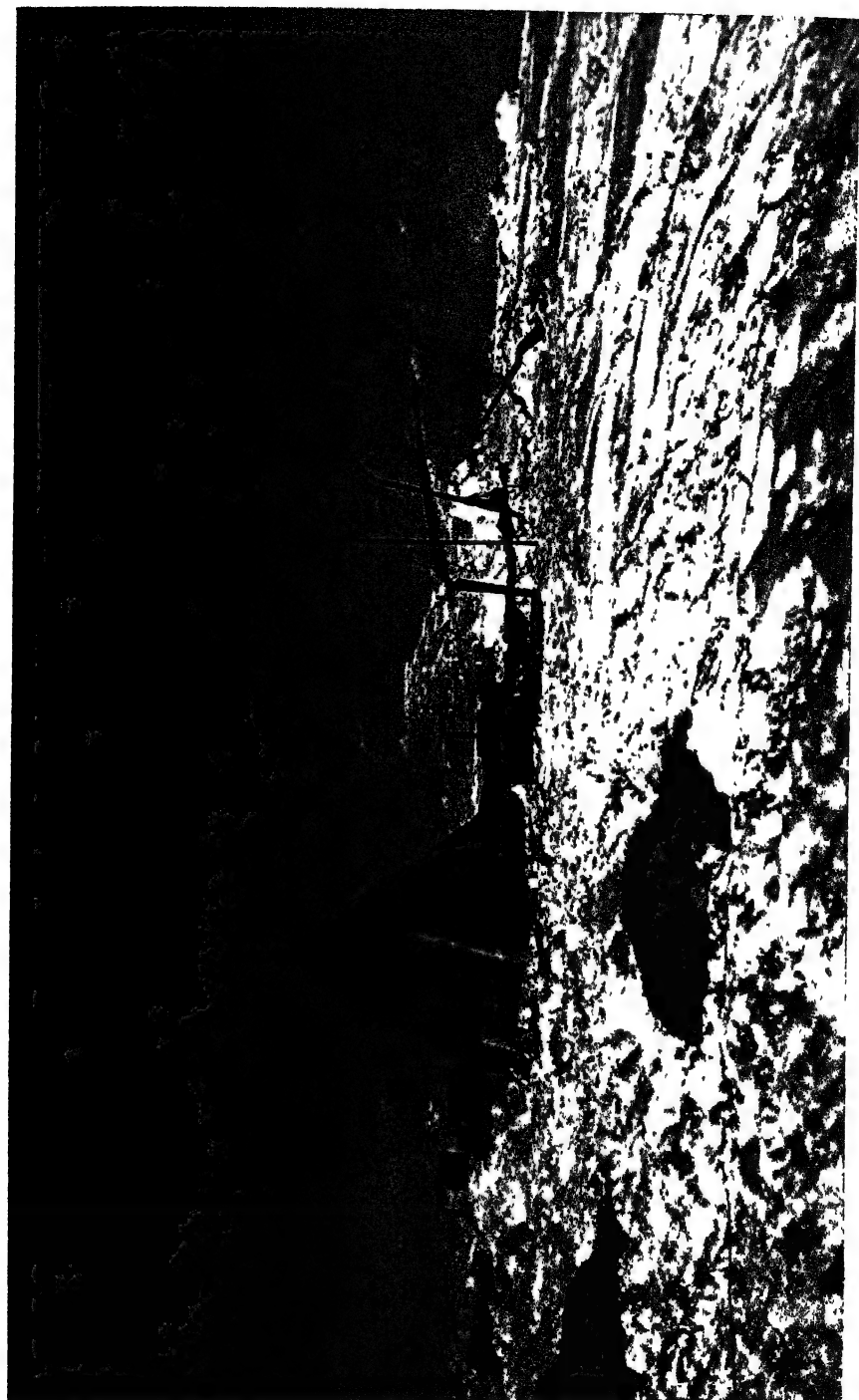


Bingham with "Wolf" *W. E. H.*



A Greenland dog in Stephenson's team

W. E. H.



A Survey Camp on the Graham Land Plateau (note aerial and wireless)

E. W. B.



Lunch time for men—

G. C. L. B.



—and dogs

G. C. L. B.



Adélie Penguin rookery

E. W. B.



Rymill among the Adélies

A. S.



Cape Pigeon sitting

B. B. R.



Shags

B. B. R.



Sledging over broken sea-ice

W. E. H.



Adélie Penguins on an ice-floe

E. W. B.



Ringed Penguin

B. B. R.



Adélie Penguin

A. S.



Preparing for a flight

W. L. S. F.



Aeroplane being taken in tow by the *Stella*

W. L. S. F.



B. B. R.

Silver-grey Petrels courting



B. B. R.

Sooty Albatross on nest



B. B. R.

Stromness Bay



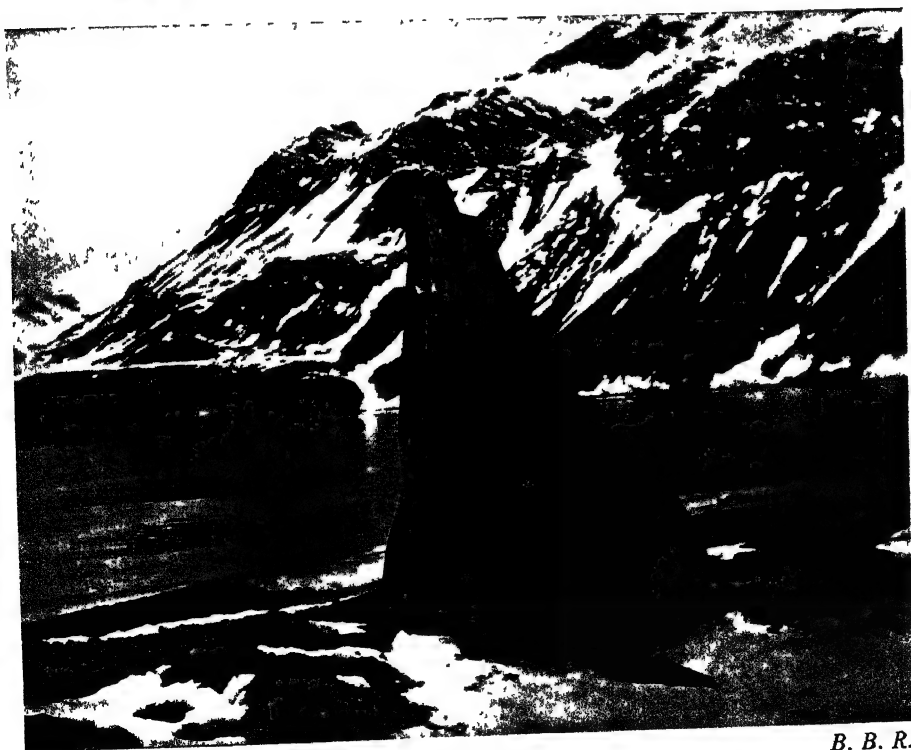
Elephant Seal pup

B B. R.



A herd of Elephant Seals

B B. R.



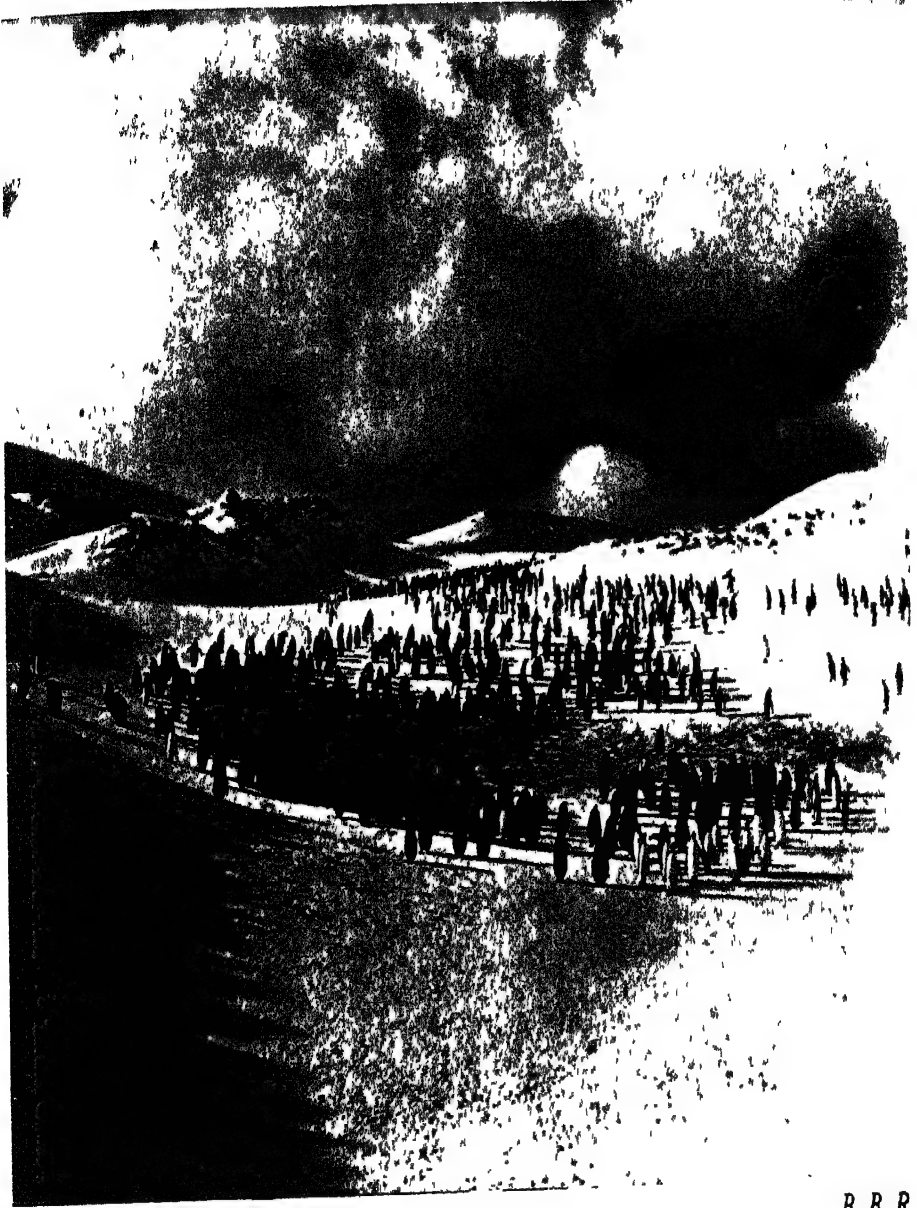
B. B. R.

Bull Elephant Seals in South Georgia



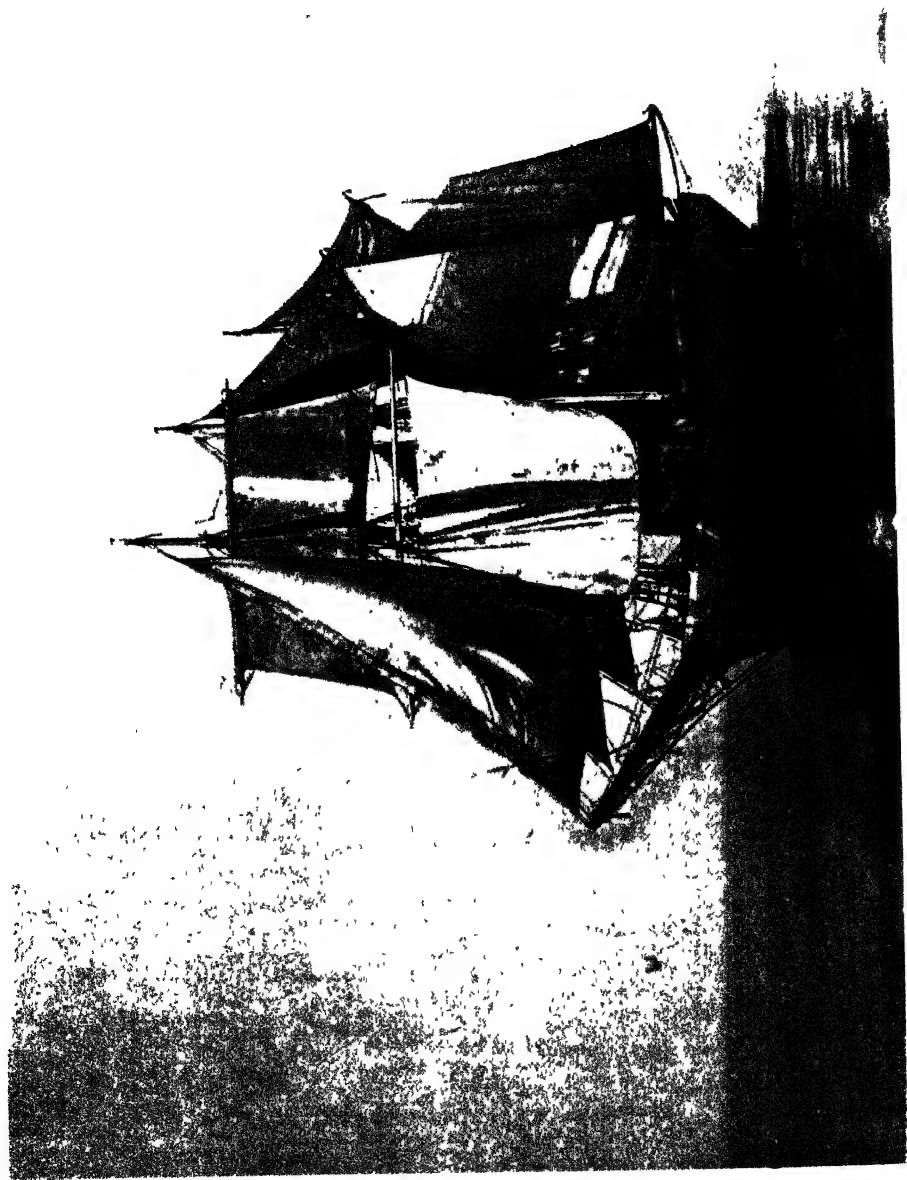
W. L. S. F.

Bingham and Rymill on their return from the eastern journey

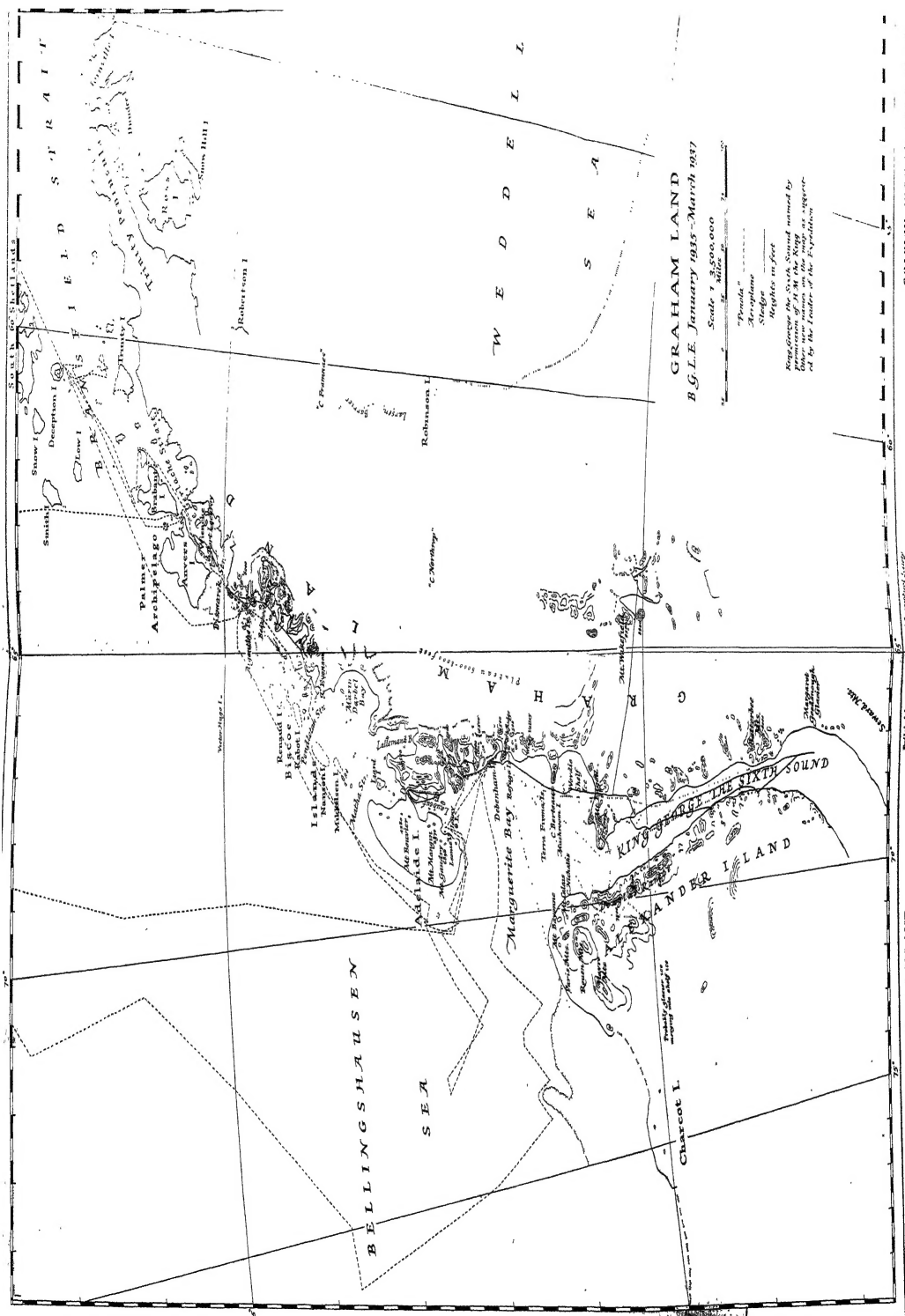


B. B. R.

King Penguins in South Georgia



The *Penola* under sail



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